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WITH WHICH ARE INCORPORATED
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Foundry Convention in Cleveland

American Foundrymen's Association Will Hold Its Meeting in Cleveland, Ohio, May 12-16, 1930. Large Exhibit of Foundry Equipment and Supplies

By F. J. HUNTLEY

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

THE annual convention of the American Foundrymen's Association will be held in Cleveland May 12 to May 16, 1930. This gathering is causing foundrymen all over the United States to direct their attention to the great industrial city on the south shore of Lake Erie.

Early settlers of Cleveland little dreamed that in a short span of one hundred and thirty-three years their trading post of a score of people would grow into a city covering 71 square miles, or that the ground, for which they paid as low as thirty cents an acre, would later sell as high as $25,000 per front foot and have a total assessed valuation of nearly two billion dollars.

Skyscrapers have replaced the log cabins of the early pioneer days, miles and miles of paved streets thronged by motor vehicles and pedestrians have taken the place of a few Indian trails, while thousands of magnificent homes have sprung up on the ground that a century ago was a wilderness.

Those visiting Cleveland during this coming convention will find a city noted for unique achievements in both industrial and civic endeavor. The city established a precedent in the civic history of American cities, when it established its Mall, a group plan of public buildings. It is in the auditorium of one of these great buildings on the Mall that the Foundrymen's convention will be held.

Looking southwest across Cleveland Public Square with the buildings comprising the new Cleveland Terminal Group and Depot; also Hotel Cleveland in the right center background. This development represents an outlay of more than $100,000,000 and includes the new Union Passenger Terminal into which a limited number of trains are already running

Cleveland's Industries

Within the boundaries of Cleveland 2,254 manufacturing plants produce in excess of a billion dollars' worth of products. Close to 135,000 wage earners are employed. In the heart of a strong buying market within a 500 mile circle—a field of unlimited trade possibilities — Cleveland naturally thrives industrially. More than one-half of the population of the United States and Canada lives within this radius. Here, too, is found more than 70 per cent of the nation's industries; 47 of the 81 principal market centers of the country; all but two of the first fifteen cities and 215 of the country's 421 cities of more than 20,000 inhabitants.

Cleveland is one of the largest producers of hardware in the

world. Plumbing supplies of all kinds, kitchen utensils, aluminum wares, lamps, lighting fixtures, roofing materials, practically everything in which are found non-ferrous metals as well as iron.

From a pioneering automobile manufacturing city in the eighties, Cleveland has grown to one of the leading

Cleveland Public Auditorium and (at Extreme Right) its Annex. The Exhibition of the American Foundrymen's Association Will Occupy More Than 135,000 Sq. Ft. of Floor Space in These Two Buildings.

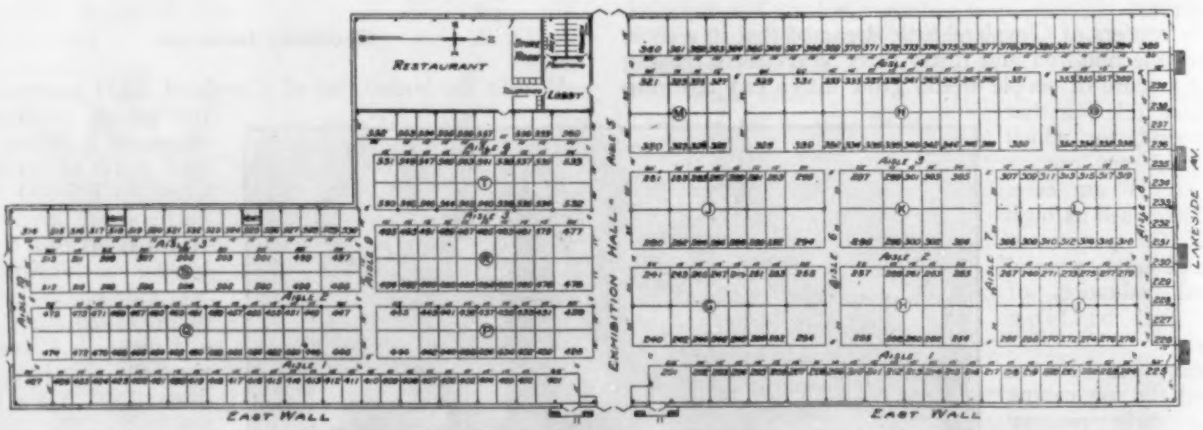
cities in the production of motor cars and trucks requiring vast quantities of foundry production of brass, copper and aluminum. The first steam propelled automobile was made in Cleveland. Its inventor first experimented with sewing machines, establishing a business which has produced and sold more than eight million of these household time savers. Later he experimented with bicycles. The next step was the steam automobile, and this eventually led to the manufacture of a line of White trucks, now used the world over. Another of Cleveland's pioneer automobile manufacturers worked in a bicycle shop in Cleveland in 1884. After many experiments, he built his first automobile in 1896. Two years later it was put on the market, the first gas-propelled car in America. There are now four pleasure cars manufactured in Cleveland—the Hupmobile, Jordan, Peerless and Stearns.

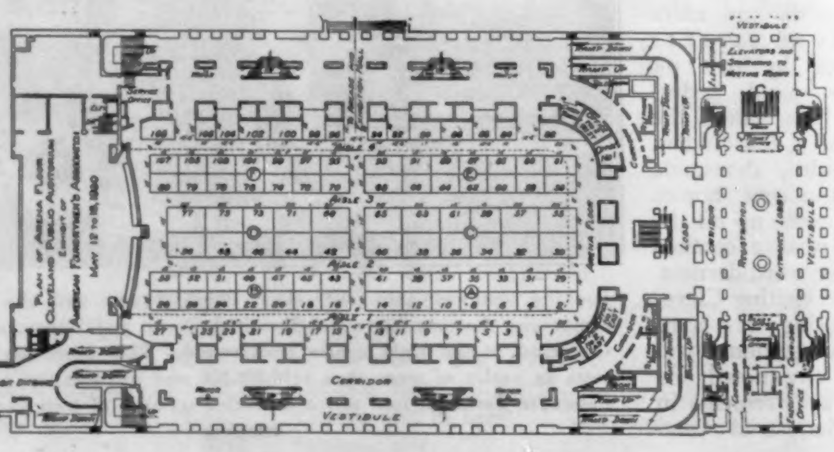
Cleveland also is a leader in the manufacture of automobile parts and accessories. No other American city is a close rival in the production of storage batteries. Motor cylinders, fittings of various sorts, motors, forgings, castings for every type of automobile are produced in large quantities. The output of automobile parts produced by Cleveland plants amounts annually to nearly $80,000,000.

The airplane industry, a large user of metals, is now beginning to make strides in Cleveland and promises to make the same showing as has been witnessed in the motor field. In this connection it might be well to say that Cleveland has one of the finest airports in the world. It probably will be visited by many of the foundrymen while they are here attending the convention.

That Cleveland is a prominent center of brass and aluminum foundry work can be seen from the firms specializing in such metals, all located in Cleveland as shown in the list on page 209.

Diagrams of the Floor Space of the Convention and Exhibition





The plan above shows the allocation of exhibitors' booths on the main floor. At the right is a plan of the arena floor of the exhibition hall.

Brass Foundries in Cleveland

Adler Brass Foundry Company, 9902 Meech Ave.
Aluminum Company of America, 2800 Harvard Ave.
American Brass Manufacturing Company, 1521 E. 49th St.
Apex Brass Manufacturing Company, 3063 E. 61st St.
Apex Electric Manufacturing Company, 1067 E. 152nd St.
Art-in Bronze Company, Inc., 1621 E. 41st St.
Arth Brass & Aluminum Casting Company, 1378 E. 33rd St.
B. & B. Match Plate Company, Western Reserve Building.
Barnes Foundry Company, 4007 Detroit Ave.
Bishop & Babcock Manufacturing Company, E. 49th and Hamilton Ave.
Brookside Brass Foundry & Manufacturing Company, 4612 Oak Park.
Buckeye Brass & Manufacturing Company, 6410 Hawthorne St.
Cedar Foundry & Manufacturing Company, 2167 E. 55th St.
Cedar Foundry Company, 5514 Cedar Ave.
Central Brass Manufacturing Company, 2950 E. 55th St.
Chicago Pneumatic Tool Company, 1241 E. 49th St.
Cleveland Aluminum Casting Company, 901 Addison Rd.
Cleveland Brass Manufacturing Company, 4606 Hamilton Ave.
Cochrane Brass Manufacturing Company, 1390 E. 41st St.
Economy Bronze & Aluminum Company, 5408 Bragg Rd.
Electric Vacuum Cleaner Company, Ivanhoe Rd.
Empire Brass Manufacturing Company, 10301 Berea Rd.
Farnam Brass Works Company, 1104 Center St., N. W.
Favorite Brass Foundry, 2539 Central Ave., S. E.
Glauber Brass Manufacturing Company, Platt Ave. & E. 79th St.
Globe Brass Manufacturing Company, 5632 Perkins Ave., N. E.
Gluntz Brass Foundry Company, 3005 E. 55th St.
Harsch Bronze & Foundry Company, 11612 Madison Ave.
Hines Pattern & Manufacturing Company, 10108 Detroit Ave.
Hoffman Bronze & Aluminum Casting Company, 1000 Addison Rd.
Holland Trolley Supply Company, 1623 E. 43rd St.
Horvath Pattern Brass Foundry, 8209 Holton Ave., S. E.
Hunger Brass Works, 1751 E. 27th St.
Ideal Bronze Company, 1265 E. 55th St.
K. & M. Brass and Aluminum Castings Company, Harvard and E. 108th St.
Kayline Fixture Company, 600 Huron Rd.
King Bronze & Aluminum Company, 1734 E. 37th St.
Leader Brass Foundry & Manufacturing Company, 3301 Jennings Rd.
Monarch Aluminum Ware Company, 4613 Payne Ave., N. E.
National Bronze & Aluminum Foundry Company, E. 88th and Laisy Ave.
Nichols-Lintern Company, 7960 Lorain Ave.
Parker Appliance Company, 10320 Berea Rd.
Pattern Castings Company, 3740 W. 143rd St.
Permold Company, 6700 Grant Ave.
Progress Foundry & Manufacturing Company, 3861 E. 93rd St.
Proof Machine & Brass Foundry Company, 936 E. 72nd St.
Redflex Signal Company, Greeley Terminal Building, 2725 Pittsburgh Ave.
Republic Brass Company, 1623 E. 45th St.
Rickersberg Brass Company, 3830 Kelley Ave.
Roby Bronze Company, 1279 W. Third St.
Royal Brass Manufacturing Company, 1420 E. 43rd St.
Russ Manufacturing Company, W. 58th St. and Walworth Ave.
Selker Brass Manufacturing Company, 1523 E. 45th St.
Standard Brass Foundry Company, 990 E. 67th St.
Sterling Brass Company, 9600 St. Catherine Ave.
United Oberndorf Corporation, 3844 Hamilton Ave.
U. S. Aluminum Company, 2210 Harvard Ave.
U. S. Aluminum Match Plate Company, 1269 W. 76th St.
Victor Brass Manufacturing Company, 6813 Wade Park Ave.
Walleck Brass Foundry Company, 2959 E. 55th St.
Weiss Brass Foundry & Manufacturing Company, 5027 St. Clair Ave.
Wellman Bronze Company, 6017 Superior Ave.
Wright Brass Foundry, 1359 W. 67th St.

Reduced-Fare Rail Tickets

Identification certificates for the purchase of railroad transportation to the Cleveland convention at reduced rates were mailed to all members of the A. F. A. Two classes of round-trip tickets are provided at reduced rates, as follows, on roads of the principal passenger associations:

Short-time limit—1½ one-way fares.

Sold May 8-14, inclusive. Return limit. May 12-22, inclusive.

Extended limit—1-3/5 one-way fares:

Sold May 8-14, inclusive. Return limit, 30 days from date of sale.

Both classes of tickets will be sold only on the identification certificate plan, and will be honored for the return trip only after being validated by rail ticket agents at Cleveland. Members may purchase, on one certificate only, reduced-fare transportation for themselves and dependent members of their families.

Firm Members of the A. F. A. who desire additional certificates may secure them on request to the American Foundrymen's Association, 222 West Adams St., Chicago, Ill.

Cleveland Hotels and Room Rates

Hotel Location	Room—one person With bath	Room—one person Without bath.	Room—two persons With bath	Room—two persons Without bath.
*Allerton, Chester Ave. at E. 13th St.	$3.00 to 3.50	$2.00 to 2.50	$5.00	$3.00 and 4.00
*Auditorium, East 6th at St. Clair Ave.	2.00 to 3.50	....	3.50 to 5.00	....
Belmont, 3844 Euclid Ave.	2.00 to 2.50	....	3.50 to 4.00	....
Charleston, 2011 Euclid Ave.	2.00 to 3.00	1.50 to 2.00	3.00 to 5.00	2.50 to 3.50
Clarendon, 3 St. Clair Ave., N. E.	....	1.25 to 2.00	....	2.00 to 3.00
*Cleveland, Superior Ave. and Public Square	3.00 to 8.00	....	5.00 to 12.00	....
*Colonial, Prospect Ave. and Colonial Arcade	2.50 to 5.00	2.00 to 3.50	4.00 to 7.00	3.00 to 5.00
Del Prado, 4209 Euclid Ave.	2.00 to 3.50	....	3.50 to 6.00	....
Fern Hall, 3250 Euclid Ave.	2.00 to 3.00	....	3.50 to 4.50	....
*Hollenden, Superior Ave. at E. 6th St.	3.00 to 6.00	....	6.00 to 12.00	....
*Mecca, 1866 E. 9th St.	1.50 to 2.50	1.50	3.00 to 3.50	....
*Gillsy, E. 9th St. at Chester Ave.	2.50 to 3.00	1.50 to 2.50	4.00 to 5.00	3.00 to 4.00
New Amsterdam, Euclid Ave. at E. 22nd St.	2.50 and 3.00	2.00	4.00 to 6.00	3.00
*Olmstead, Superior Ave. at E. 9th St.	2.50 to 4.00		5.00 and 6.00	
Regent, 10539 Euclid Ave.	2.50 to 3.00	1.75 to 2.00	4.00 to 5.00	3.00 to 3.50
Stag, 1834 Prospect Ave.	....	2.00 to 2.50	....	4.00 to 5.00
*Statler, Euclid Ave. at E. 12th St.	3.00 to 9.00	....	4.50 to 16.00	....
Sterling, Prospect Ave. at E. 30th St.	2.00 to 3.00	....	3.00 to 5.00	....
Stockbridge, 3328 Euclid Ave.	2.50 to 3.50	....	4.00 to 6.00	....
*Winton, Prospect Ave., near E. 9th St.	3.00 to 5.00	....	4.50 to 7.00	....

Schedule of Sessions and Papers on Non-Ferrous Metals

Monday, May 12

12:00 Noon—Exhibit Opens and Registration Begins.

2:00 P. M.—Opening Business Session.

Tuesday, May 13

10:00 A. M.—Foundry Costs.

Organizing a Non-Ferrous Foundry Cost Group. C. S. Humphries, Westco Chippewa Pump Company, Davenport, Iowa.

2:00 P. M.—Non-Ferrous Foundry Practice.

Deep-Etch Test of Brass. W. F. Graham and L. A. Meisse, Ohio Brass Company, Mansfield, Ohio.

Application of Ingot Metal to Production of Brass and Bronze. Wm. Romanoff and C. O. Thieme, H. Kramer & Company, Chicago.

Overcoming Alloy-Ingot Troubles in the Brass Foundry. Wm. S. Paulson, Thomas Paulson & Son, Inc., Brooklyn, N. Y.

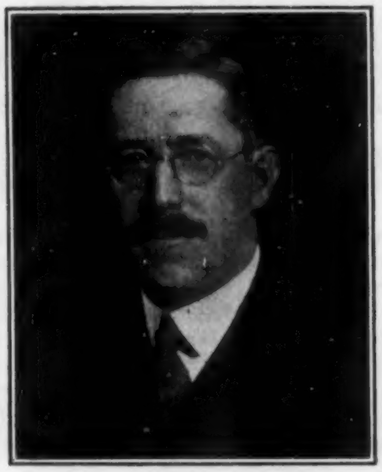
4:00 P. M.—Shop Operation Courses.

Non-Ferrous Founding.

Wednesday, May 14

10:00 A.M.—Non-Ferrous Founding.

(a) Care and Maintenance of Fuel-Fired Furnace Linings in the Non-Ferrous Foundry, and



N. K. B. Patch
Secretary, Lumen Bearing Company, Buffalo, N. Y.
Incoming President of the A. F. A.

(b) Selection and Use of Refractory Maintenance Cement in the Non-Ferrous Foundry. H. E. White, Lava Crucible Company, Pittsburgh.

Stronger Aluminum Castings by Improved Foundry Practice. E. M. Gingerich and H. J. Rowe, Aluminum Company of America, Pittsburgh.

Progress in Die-Casting Industry. Marc Stern, A. C. Spark Plug Company, Flint, Mich.

2:00 P.M.—Sand Control.

Sand Control as Viewed from the Producer's Standpoint. W. W. Kerlin, Enterprise Sand Company, Pittsburgh.

Reports on Committees.

4:00 P.M.—Shop Operation Courses.

Non-Ferrous Founding.

Thursday, May 15

10:00 A. M.—Apprentice Training.

Foundry Apprentice to Apprentice Foreman. E. H. Ballard, General Electric Company, West Lynn, Mass.

Where are the young Foundrymen? S. W. Utley, Detroit Steel Casting Company, Detroit.

12:15 P. M.—Round Table—Non-Ferrous Founding.

Chairman, H. M. St. John, Detroit Lubricator Company, Detroit.

4:00 P. M.—Shop Operation Courses.

Non-Ferrous Founding.

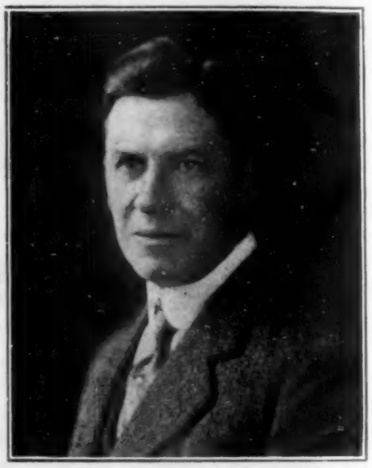
Friday, May 16

10:00 A. M.—Materials Handling.

Continuous Core Ovens. D. B. Hill, Palmer-Bee Company, Detroit.

Materials Handling. W. M. Booth, Syracuse, N. Y.

Reducing Materials Handling Costs in the Jobbing



C. E. Hoyt
Secretary-Treasurer of the A. F. A.

Foundry. F. C. Campbell, Eastern Corporation, New York.

10:00 A. M.—Melting Furnaces and Core Practice.

Induction Furnaces for Ferrous and Non-Ferrous Metals. Manuel Tama, Berlin, Germany.

Value of Analyses and Specifications for Core Oil. J. A. Gitsen, Lindsay-McMillan Co., Milwaukee.

A study of Non-Ferrous Crucible Melting. H. E. White, Lava Crucible Company of Pittsburgh.

Features of the Foundry Convention and Exhibit

Exceptional facilities for housing the Foundrymen's Convention and Exhibit of equipment, machines and supplies are provided in the Cleveland public auditorium, where the sessions will be held. Fully 175 industrial firms will be represented, and close to 100,000 square feet of floor space will be occupied.

The exhibitors' dinner, an annual affair, is scheduled for Tuesday evening, May 13. Another welcome feature will be the annual A. F. A. banquet, which will take place on Thursday evening, May 15.

An educational and technical display will be an added feature of the exhibit this year. This exhibit will contain displays prepared by various A. F. A. committees, and will include sand testing apparatus, apprentice contests material, exhibits of castings, refractories, many engineering schools and a metallurgical and physical testing laboratory.

Sessions on metallurgy, engineering practice, management and practical shop operation have been included. As the interests of the members and guests attending are so

Some Members of the Welcoming Committee of the Convention

S. S. PARSONS
New Haven Sand Blast Company, New Haven, Conn.

D. J. GLUNTZ
Gluntz Brass Foundry Company, Cleveland, Ohio

H. G. WELLMAN
Wellman Bronze Company, Cleveland, Ohio

divergent, the 1930 sessions will be so organized as to limit the subjects covered at any one meeting. A sufficient number of sessions will be provided, however, to cover all the important phases of foundry practice.

Under the management section will be sessions on general management problems, apprentice training and foundry costs. Metallurgical practice in the four major branches of the industry will be brought out in the regular sessions, organized on lines similar to those which have been successfully pursued at past conventions.

Of considerable interest every year are the informal round-table luncheon discussions, which again will be held. Three such round-table sessions are scheduled, covering malleable iron, steel and non-ferrous foundry subjects.

The shop operation courses at former annual meetings will be broadened this year to include a course on the fundamentals of non-ferrous shop practice.

These courses are organized especially for the practical shop man and will be conducted by leaders thoroughly familiar with shop problems. Each course will consist of three or four sessions, beginning at 4 p. m. on the days scheduled.

Shop Operation Courses

Tuesday, May 13

4:00 P. M. Non-Ferrous—Fuel-Fired Furnace Melting.

Leader: E. R. Darby, Federal Mogul Corporation, Detroit.

Wednesday, May 14

4:00 P. M. Non-Ferrous—Induction-Type Electric Furnace Melting.

Leader: R. W. Parsons, Ohio Brass Company, Mansfield, Ohio.

Thursday, May 15

4:00 P. M. Non-Ferrous—Indirect-Arc-Type Electric Furnace Operation.

Leader: D. E. Broggi, Neptune Meter Company, Long Island City, N. Y.

New Officers

Candidates for election as officers and directors were nominated at a meeting of the nominating committee in Cleveland in January, as follows:

For President, to serve one year:

N. K. B. Patch, Secretary, Lumen Bearing Company, Buffalo.

For Vice-President, to serve one year:

E. H. Ballard, General Foundry and Pattern Shop Superintendent, General Electric Company, West Lynn, Mass.

For Directors, each to serve three years:

C. S. Anderson, Vice-President and General Manager, Belle City Malleable Iron Company, Racine, Wis.

H. R. Culling, Vice-President, Carondelet Foundry Company, St. Louis.

Fred Erb, President, Erb-Joyce Foundry Company, Detroit.

R. M. Maull, Treasurer, Tabor Manufacturing Company, Philadelphia.

D. M. Scott, Vice-President, Symington Company, Rochester, N. Y.

Foundry Instructors to Hold Dinner Meeting

The men who teach foundry subjects at engineering schools will get together on Wednesday evening, May 14, for their annual Foundry Instructors' Dinner, held in connection with the American Foundrymen's Association convention at Cleveland.

This event has become a regular and well-attended feature of the foundry convention. It was organized for the purpose of bringing together the engineering shop instructors of the various engineering schools at a time when they might also take advantage of the convention sessions and exhibition of foundry equipment.

This year the dinner meeting will be addressed by a well-known foundryman on the subject, The Place of the Engineering Graduate in the Foundry Industry of Today. A. E. Wells, director of Engineering Shop Laboratories, Cornell University, Ithaca, N. Y., will preside.

A Special Bronze Casting Problem

Molding a Hub Disc for a 3-inch Slurry Pump

By JOSEPH P. McGINNIS
E. R. Caldwell & Son Brass Company, Syracuse, N. Y.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

FIG. 1 shows the dimensions, Fig. 2 and Fig. 3, sections of a mold for the hub disc of a 3" slurry pump, made for the Morris Machine Works, Baldwinsville, New York. It occurred to the writer that an article that would bring out a few points that came up in the making of the mold for this casting might prove of interest to the younger members of the brass foundry family.

One of the points is that as every pattern is a problem in itself; it should be gone over very carefully to determine the surest and cheapest way to mold it, so as to produce a good casting. The other point relates to chaplets.

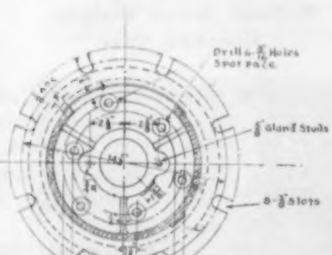


Fig. 1.—Dimensions of Hub Disc for 3 in. Slurry Pump

Chaplets are, like many things, necessary evils, and when used in castings that have to stand pressure, particular attention should be given them. Those used in this case were made from ¾" round rods, of the same alloy as the casting. They were ground as shown, the edges made thin so as to melt when surrounded by the molten metal, while the center was left large enough to hold the core in place till metal cooled.

On examining the pattern when it was received it was seen that the pattern maker had the dowels arranged so the 7" x 10" opening in the casting would be in the drag part of the mold.

The writer thought it best to make it with the opening in the cope, the opening being an ideal place for a chaplet.

Figs. 2 and 3, show so clearly how mold looked, that the way it was made will be gone over very briefly.

When it was decided how the casting would be made, holes were bored in the mold board for the dowels in the pattern, which was laid on the board.

The drag was put in place and rammed up, care being taken to have core supports vertical and sand rammed snugly around them and the bricks, which were put on the core prints to keep the cores from settling and crushing the sand around the flange.

With the drag rammed and rolled over and the mold board removed, the parting was made and the cope part of the pattern put on the drag part. Parting sand was thrown on the joint. The cope was put on and clamped, sprues set and cope rammed, a 1½" sprue being put on top of the pattern at the center of the opening and risers placed on top of the flanges. The cope was vented, lifted off and both cope and drag finished.

The writer would call attention at this time, to the way drag chaplets are set in castings of the size and thickness of this one. In practically all the foundries he has worked in, when finishing the drag part of the mold, a cone shaped hole is made in the sand at the bottom of the mold. The length the chaplet is to be is found and the chaplet, like those shown in Fig. 2 (except that it is sharpened), is

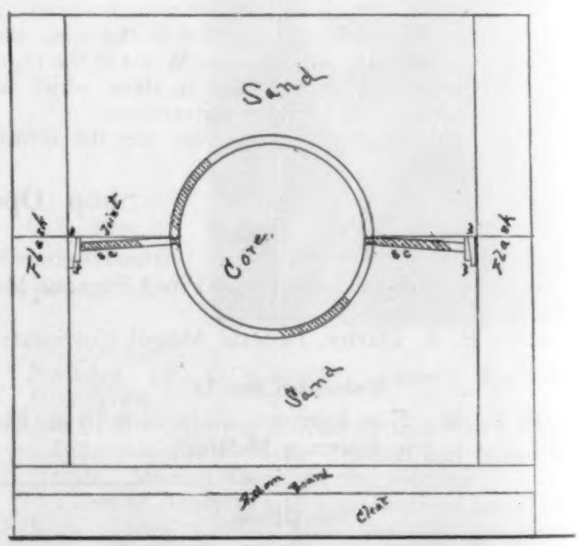


Fig. 2.—Mold Section. SC—Side Chaplets; W—Wedges

driven into bottom boards till the distance from the top of the chaplet to the bottom of mold, is the same as the thickness which the casting is to be.

Flat cores are also sometimes used, the chaplets being put on them, but if the center core is moved much in setting, the chaplet is likely to cut both cores.

All in all, the way used seems to the writer the best.

To resume, the chaplets were put on chaplet supports in the drag. A flat place was filed on the main core, care being taken that it would come in the center of opening. The end and main core were put together and put in mold; the side chaplets put in place and fastened. After putting a piece of a flat file on main core where it was filed, the cope was put on and clamped up. A 1¼" iron chaplet was put down the hole, on top of the piece of file. A

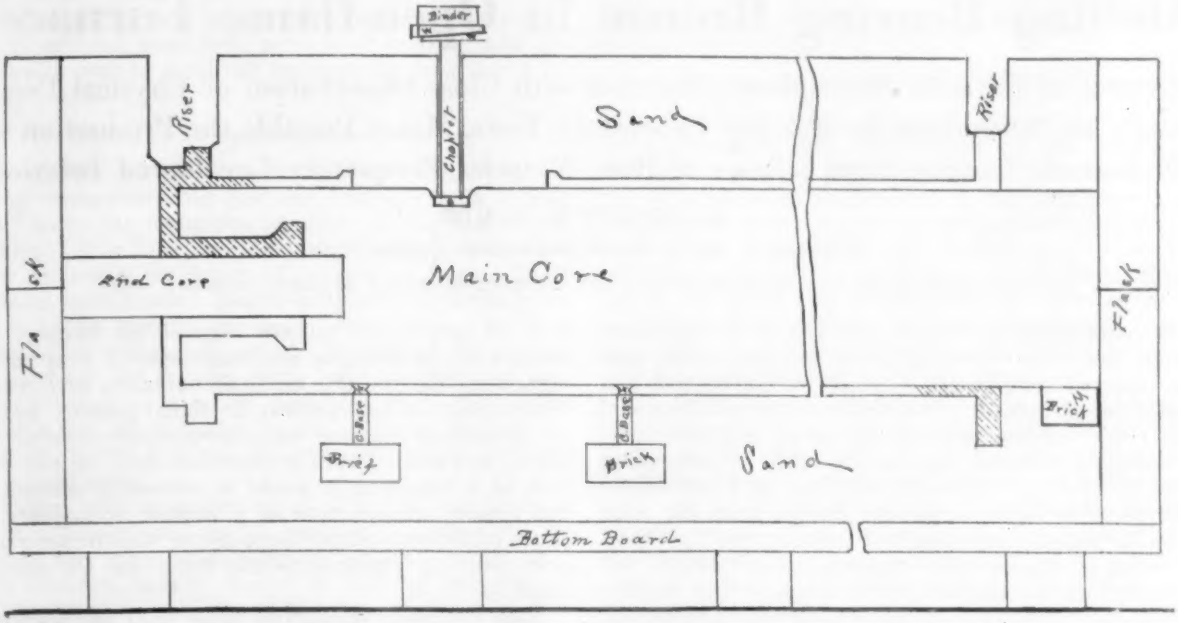


Fig. 3—Mold Section. X—Chaplets: O—Piece of Flat File; W—Wedges

binder was put across the flask and clamped, and chaplet wedged down.

The casting was poured two up, being gated at both ends. It weighed 497 lbs.

Bronze for Mule Shoes

Q.—We have for some time been furnishing a powder manufacturing company with bronze mule schoes. They prefer to use bronze because of the danger of sparks from steel shoes causing an explosion.

Various mixtures have been tried, but we get them either too soft, so that they wear out soon, or too hard, so that they break. Can you suggest a mixture that is tough and at the same time is not too soft to wear well?

A.—For such work we would suggest a mixture of 88 copper, 10 aluminum, 2 iron. Use new tinned iron sheet clips for the iron. Melt copper and iron and just as soon as the copper is melted, add the aluminum. Stir well.

This metal will give you the results desired. It will wear as good as steel, being very tough if made properly. If there is any objection to the 2 per cent iron, you can use 90 copper and 10 aluminum. Use new copper and new aluminum. We do not think, however, that there will be any objection to the iron. —W. J. Reardon.

Bronze Welding Materials

Q.—We are interested in finding some sort of bronze similar to aluminum bronze that will acetylene-weld readily to cast iron, free from blow holes. We have not had much luck with aluminum bronze, but we would like the strength that aluminum bronze has, as near as possible, so we are asking you what you can tell us about other bronzes on the order of manganese bronze or phosphor bronze, and whether in welding by the acetylene process a flux should be used.

The cast iron piece to which we weld is rather large, so we have to pre-heat it, and we can pre-heat to any degree up to about 1,200° Fahrenheit, but we would not like to pre-heat the piece hotter than this because there are stresses in the casting that might cause it to be pulled out of shape. The trouble that we have had, which consists principally of the presence of blow holes in the welded job after it is done, does not seem to be removed when the job is done by expert welders, so that we attribute it to the material rather than to the welder.

A.—Aluminum bronze can be welded. A stick of the same material is used. The operation is a puddling job similar to the method of welding aluminum castings. The metal is brought almost to the melting point and the iron is heated as hot as you can allow. The welding rod is melted to the thickness of molasses. No flux is required. A steel rod turned and flattened on the end is used to do the pudding. It may be necessary to build up a form around the part to be welded to prevent the metal flowing away.

Monel metal, also, can be welded to cast iron. We would also suggest that you try the 88-10-2 Alloy (88 copper, 10 tin, 2 zinc). This alloy has been welded; also manganese bronze. They all, however, are hard to do and considerable trouble is experienced. Monel metal welds the best, we have found. —W. J. Reardon.

Special Aluminum Alloy

Q.—I have a quantity of aluminum castings to make. Specifications for these are as follows: Metal to be composed of 92.5 aluminum, 0.6 copper, 4.5 to 6.0 silicon, 0.20 zinc, 1.0 iron, 0.2 manganese.

Please give me information on producing this alloy.

A.—We would suggest that you make up a hardener composed of the following:

Silicon	20
Zinc	1
30 per cent manganese copper	1
Iron	3
Copper	6
Aluminum	69

Pour in ingots and use as follows: Melt 70 pounds aluminum and add 30 pounds of the hardener.

However, you can buy this ingot cheaper than you can produce the hardener and the alloy. You will not have any trouble meeting the physical requirements.

—W. J. Reardon.

Melting Bearing Bronze in Open-flame Furnaces

Control of Furnace Atmosphere, Together with Close Observation of Physical Properties as Determined by Routine Laboratory Tests, Makes Possible the Production of High-grade Castings from Classes of Raw Material Frequently Considered Inferior.

By ERNEST R. DARBY

Metallurgist, Federal Mogul Corporation, Detroit, Mich.

A PAPER READ AT THE NEW YORK MEETING OF THE INSTITUTE OF METALS DIVISION, FEBRUARY, 1930

IF the correct balance between fuel and air is maintained in an open-flame furnace,[1] little chemical action may be expected between the products of combustion and the metal being melted. Physical changes in the metal are the object of the melting operation, and indirectly, under certain conditions, may be the cause of subsequent chemical actions. If sufficient heat has been introduced into the metal to bring about the change from the solid phase to the liquid phase, and still further from the liquid to the vapor phase, the metal vapor in all probability will be carried from the furnace by the exhaust and rapidly combined with the oxygen of the outside air. The charge being melted in the furnace may contain elements which are chemically inactive at normal temperatures, but which will form compounds at the elevated temperatures of the metal bath, or even at a lower degree. Such indirect chemical actions are very confusing and often lead to incorrect conclusions regarding furnace atmospheres.

In the open-flame furnaces used in the melting of bronze, the furnace atmosphere is spoken of as being either neutral, oxidizing or reducing in its effect upon the metal. A neutral atmosphere, as mentioned, is generally considered as the atmosphere of the furnace that will produce melted bronze, neither oxidized nor gassed. It is in effect an atmosphere which is not directly the cause of any chemical action. In such an atmosphere absolutely pure metals may be melted and poured without the absorption of gases or the formation of metallic oxide. The metal has undergone a simple, physical change.

An oxidizing atmosphere is one in which the air introduced to the furnace is in excess of that required to complete combustion of the fuel used. The oxygen of the excess air many combine with the metal being melted to form metallic oxide, which may or may not be dissolved by the metal. If an absolutely pure metal is melted in a furnace operating with such an atmosphere, a portion of the metal charged may be converted into metallic oxide, the amount depending upon the duration of the melting operation and the temperature to which the metal bath may be raised. The metal has undergone a chemical as well as a physical change.

The atmosphere spoken of as being "reducing" is the direct opposite of the oxidizing one. The reducing atmosphere is produced by an excess of fuel over that required to completely combine with the air of the furnace. The resulting incomplete combustion gives rise to gases that are reducing in their action upon metallic oxides. In an atmosphere of this kind metal containing quantities of oxide may be melted and the oxide reduced to metal by giving up its oxygen to the unburned fuel gases to assist in complete combustion.

Selecting a Furnace Atmosphere

Of the three conditions of atmosphere mentioned, the most difficult to obtain in practice is the neutral one. Since it represents an absolute balance between fuel and air, it is by nature very narrow between its marginal limits, so narrow, in fact, that one may consider it as but a line separating the broader fields of oxidation and reduction. It is almost an impossibility in actual practice to operate an open-flame furnace on a theoretically neutral atmosphere, and even if such a condition could be effected, the task of determining it would be extremely difficult. For this reason, the selection of a furnace atmosphere is reduced to the problem of determining whether an oxidizing or a reducing condition is the better for the purpose in mind.

Most bronzes, particularly those used for bearing purposes, readily absorb gas formed by incomplete combustion, the rate or amount of solution increasing rapidly with the increase in metal temperature, the duration of overheating, and the increase in explosion pressure of the incoming fuel. Considering the melting operation as being divided into two periods, (1) that in which the metal is raised from normal temperature to the temperature of liquefaction and (2) that in which the excess heat necessary for handling and pouring is introduced, then the second period is the one in which a reducing atmosphere gives the greatest possibility of gas absorption.

Since the most harmful effect of gas is due to its precipitation at or near the temperature of solidification, with a reducing atmosphere there is little danger of gas absorption during the first period. There is, however, in this period a possibility of the formation of sulfides, which subsequently may be absorbed by the melt. This possibility is not serious if the fuel is the only source of sulfur, for few fuels for melting purposes contain as much as 1 per cent of this element. Assuming 130 lb. of oil as the amount required to melt 1,000 lb. of bronze, then with a 1 per cent sulfur content, 1.3 lb. of sulfur must pass through the furnace. Not over one-tenth of this amount could possibly be absorbed by the metal, which would represent but 0.013 per cent of the 1,000 lb. of metal melted. Such an amount in itself cannot be serious, but by accumulation through frequent remelting or by additions in some form with the metal charged the first period may be accompanied by considerable sulfur absorption.

Though the absorption of gas and the absorption of sulfur are the two most harmful results directly attributable to melting with a reducing atmosphere, there are other indirect results just as harmful which should be considered. When the charge to be melted is made entirely or in part of secondary metal there may be many impurities which, if not removed, will cause defective castings. Small amounts of aluminum and silicon are almost sure to be disastrous. Iron and sulfur are very objectionable. Even phosphorus, so generally used in nonferrous foundries, may cause considerable trouble with high-lead and high-zinc alloys. Such impurities are but slightly affected by melting in a reducing atmosphere, and may greatly aggravate and confuse the results of gas absorption.

On the other hand, a reducing atmosphere may be high-

[1] The term "open-flame furnace" is meant to apply to furnaces using oil and gas as fuel, with the flame in direct contact with the metal. Crucible furnaces are not included in this article.

ly desirable when the metal charge contains considerable metallic oxide. This is particularly true when the oxides are heavier than the resulting alloy. In such a case reduction may proceed over both periods of melting and absorbed gases may be rendered harmless by their action on submerged oxides.

Melting in an Oxidizing Atmosphere

Turning now to the consideration of melting in an oxidizing atmosphere, we find the first and most serious difficulty to be the formation of oxides in the first period of melting. It is then that the metal charge presents the greatest surface to the action of the furnace flame. Small particles of melted metal dropping downward through the charge may be entirely converted into oxide. In most cases the oxide will rapidly attack the silica of the furnace lining, causing the formation of large amounts of slag and contributing to a heavy metal loss. In the second period this loss by oxidation is not so heavy because the slag formed in the first period serves as a protective layer to the melted metal.

But this process of oxidation, if controlled, can be made to serve a definite and useful purpose. Fortunately the impurities are more readily converted into oxides than are the elements usually desired in bearing bronzes. If these impurities are not present in too great amounts, they may be rendered harmless by selective oxidation. Once converted into oxide, such impurities, being lighter than the metal bath, stay upon the surface and unite with the slag. In addition to this, the excess air of the furnace reduces to a minimum the danger of gas absorption by the melted metal. It does this in two ways: first, by greatly reducing the amount of soluble gas in the furnace, and second by reducing the solubility of these gases through the presence of oxide in the melted metal.

The solubility of hydrogen, carbon monoxide and sulfur dioxide in copper is greatly reduced by alloying with tin or with zinc. It is still further reduced by the presence of oxygen in the metal, the hydrogen and carbon monoxide being oxidized and the metallic oxides reduced. In the case of sulfur dioxide there is no further oxidation but the saturation point of the alloy for this gas is reduced in the same way that tin and zinc reduce the saturation point of hydrogen and carbon monoxide in copper. The burning of sulfur to sulfur dioxide in the furnace chamber does not render the sulfur of the fuel insoluble in the metal, but the oxygen taken up by the metal as oxide makes the solution of the sulfur more difficult.

It would then appear that slight amount of oxide in the metal is essential to the production of sound castings from open-flame furnaces when the metal to be melted is of the kind here considered. Just how the correct amount may be kept present is a question for which no hard and fast rules may be laid down. It is a matter of adjustment of practice to suit individual furnace installation and metals to be melted. Oilfired furnaces as a whole give less trouble from gased metal than do furnaces fired with gas. This is because the products of incomplete combustion with oil are largely carbon and carbon monoxide, while with gas, carbon monoxide and hydrogen may both be present. Hydrogen is much more readily absorbed by the metal than is carbon monoxide—in fact, many believe carbon monoxide to be practically insoluble—so that a fuel containing 50 per cent free hydrogen is much more dangerous from the point of gased metal than one containing practically no free hydrogen. The reduction of carbon dioxide to carbon monoxide by carbon is the only source of gas to be encountered in connection with the use of oil, as the possibility of hydrogen by the reduction of water vapor in the usual installations is very small. However, there is generally much more sulfur in oil than in gas and where metal is to be melted over and over, because of the percentage of gates and turnings produced, this factor may become of considerable importance.

Controlling Gas Absorption, Oxidation and Impurities

In preceding paragraphs it has been pointed out that there is considerably less danger of gas absorption in the first period of melting than in the second. By the use of a reducing atmosphere in the first period and an oxidizing atmosphere over at least a portion of the second period, the dangers of gas absorption and too severe oxidation may both be eliminated. The amount of oxygen left in the metal may be controlled by varying the length of the oxidizing period. In this way, metallic impurities may be to a large extent removed or held at a minimum, and the sulfur content materially decreased.

Through careful analysis of incoming material, and close observation of results assisted by routine physical tests, the adjustment of a satisfactory furnace practice along the lines mentioned should not be a difficult matter.

A careful chemical analysis of incoming material for metallic and nonmetallic impurities is a valuable guide to the extent oxidation may be necessary, or with a standard furnace practice, will determine the amount of dilution consistent with desired results. However, physical tests from metal poured will be the final measures of the correctness of practice. Such tests as strength, elongation and hardness are excellent for the determination of soundness of the material, but as these require special molds and consume considerable time in the making, a simple fracture test is the usual practice where immediate results are necessary. From such a test the extent of shrinkage and absorbed gases, and the presence of impurities such as aluminum and silicon, may be estimated. In connection with a rapid chemical test for sulfur, the results of the fracture test often give sufficient evidence upon which to judge the kind of gas that may be absorbed. For the detection of dross and slag inclusions the rough machining of a casting is almost necessary. Fracture tests in this respect are not satisfactory, as not enough of the sample is exposed by this means for observation.

In connection with this it is interesting to observe that hardly ever will a sample showing gas inclusions be found to contain spots of dross. The one defect is the opposite of the other, just as a reducing atmosphere is the opposite of an oxidizing atmosphere. The condition responsible for visible dross is seldom the cause of absorbed gas.

Analysis of Pewter

In our April issue, page 183, under the heading "Pewter Finish," it was stated that "the pewter now seen is in general composed of 95% tin and 5% lead."

We have received communications from one or two prominent pewter manufacturers questioning this formula, and stating that their standard contains no lead but consists of 92% or 93% tin, the rest being antimony and copper.

Unfortunately, there are no official standards for pewter or Britannia metal (the names are often used interchangeably). It is a fact, however, that the alloy containing no lead is far superior, especially for tableware.

We consider it a promising sign that the leading manufacturers are stressing this point and placing their standards on a high plane. This should be taken up with the Federal Specifications Board and a standard set so that manufacturers of high grade pewter can be protected. In other words, give a "Sterling" mark to pewter.

Casting Railway Bronzes in Permanent Molds

A Description of the Methods Used and the Advantages Over Sand Molding

By HENRI MARIUS

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WRITTEN ESPECIALLY FOR THE METAL INDUSRY

As its name implies, a permanent mold is one that holds its form permanently, in contrast to the sand mold which has to be made over again after each pouring. The most common materials these molds are made from are, copper, carbon or alloy steel and alloy or plain gray-iron; each one of these groups of materials possesses certain inherent advantages and may be more suitable than the others for certain specific molds, but, the gray-iron group on account of low manufacturing costs, resistance to warping and distortion at elevated temperatures and the graphitic carbon in them acting very much like a facing material (thus helping to prevent the casting from sticking to the walls of the mold), are more universally used, particularly in making molds for casting brass and bronze alloys.

Advantages of Chill Cast Bronze

The prime motive in casting leaded bronze railroad specialties designated under the collective name of "wearing alloys" in permanent molds is the desire to increase the power of tin to hold in the lead by the chilling effect of these iron molds and incorporate as much lead into these alloys as is compatible with the necessary amount of tensile and compressive strength, hardiness and resilience, to withstand shocks and pounding coincident with the running of a locomotive under varied speed and loads. The antifrictional qualities of lead are too well known to require any special mention here, and it is safe to assume that all conditions remaining the same, the larger the amount of lead in a bearing or bushing the better their antifrictional qualities; for the same reason the smaller the rate of wear. This assumption is proved to a certain measure by results of actual service tests among the various railroads that are using chill cast high lead bronzes.

At this juncture, however, it is worth while to make mention of the fact brought out by reliable investigators, that the antifrictional properties, and naturally the wearing quality of lead, on simple friction, are enhanced materially by larger grain size. This being the case, it seems that a sand cast bearing which, because of its slower rate of solidification, has a coarser microstructure and naturally larger lead grains, ought to show a lower rate of wear than the chill cast bearing with its considerably finer microstructure and finer lead grains. Yet, this is not in accord with the experience of the railroads who claim that the chill cast bearing is giving them better wearing service than the sand cast. This apparent contradiction is due to the fact that a railroad bearing at no time performs under simple friction. Also, the usually higher lead content of the permanent mold cast wearing alloy probably does more than offset the advantage due to larger lead grain of the sand cast alloy. Our own observations lead us to believe that the wearing qualities of a bearing or bushing are dependent to an equal degree on the freedom from segregated lead or copper-tin alloys and metallic oxides (particularly those of copper), and on an even hardness throughout the bearing surface. In other words a homogeneous microstructure, free from segregated oxides is of first importance.

It is unquestionable that chill brass and bronze alloys of whatever composition they may be, possess a finer, denser, far more homogeneous microstructure, of more even hardness than it is possible to have in the best sand cast alloys

TABLE 1

Chemical composition of heats grouped together from which test bars were made.

		SAND CAST				PERMANENT MOLD CAST			
Nos. of pieces tested in all	Dimension of tested bars	Average Elastic limit per sq. inch	Average Ultimate tensile strength per sq. inch	Average Elong. in two inches	Hardness in Brinell figures	Average Elastic limit per sq. inch	Average Ultimate tensile strength per sq. inch	Average Elong. in two inches	Hardness in Brinell figures
Cu. 77.50% to 80%. Sn. 7% to 8%. Pb. 11.50% to 13.50%. Zn. 0.50% to 1%. Sb. 0.10% to 0.35%. Undetermined 0.10% to 0.30%.									
24	.505"	16,408 lbs.	26,034 lbs.	14.5%	58	20,075 lbs.	32,337 lbs.	16.6%	65
		Average permanent set in fraction of an inch under 65,000 lbs. load on one inch cubes .184				Average permanent set in fraction of an inch under 65,000 lbs. load on one inch cubes .162			
Cu. 70% to 72%. Sn. 5% to 6%. Pb. 20% to 22.5%. Zn. 0.70% to 1.30%. Sb. 0.35% to 0.60%. Undetermined 0.15% to 0.35%.									
21	.505"	14,784 lbs.	22,400 lbs.	9.7%	52	17,657 lbs.	26,607 lbs.	11.7%	59
		Average permanent set in fraction of an inch under 65,000 lbs. load on one inch cubes .240				Average permanent set in fraction of an inch under 65,000 lbs. load on one inch cubes .204			
Cu. 85% to 87%. Sn. 6% to 7%. Pb. 3.50% to 5%. Zn. 2% to 3%. Undetermined 0.0% to 0.20%.									
29	.505"	17,502 lbs.	29,379 lbs.	19.6%	59	19,829 lbs.	34,514 lbs.	19.4%	63

of similar composition. For these same reasons chill cast brass and bronze have greater strength as expressed by uniformly higher elastic limits, tensile and compressive strength with good ductility and toughness. (See Table 1.)

The results of physical tests contained in the following table are representative of actual foundry practice over a period of four years. They have been gathered together

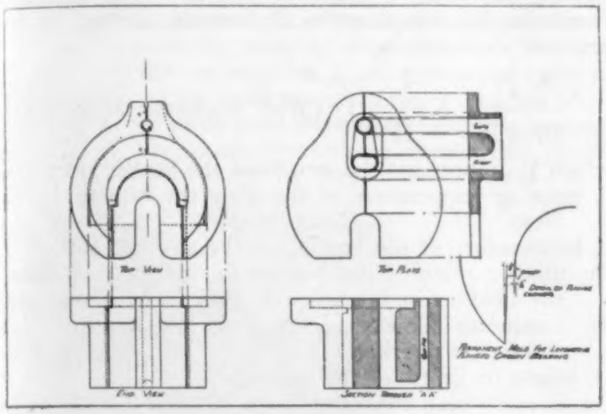


Fig. 1—Typical Permanent Mold

in order to express in figures at least, so far as strength is concerned, the betterment in quality of brass and bronze through permanent molds as compared with sand molds. All test bars were cut from actual castings, such as bearings, rod brasses, bushings, etc., and all permanent mold castings with the corresponding sand mold castings from which test bars were cut, were of identical pattern, poured from the same heat from the same ladle-full. The test bars were cut from exactly the same position in each casting. This was done in order to have, as nearly as possible, an accurate, true physical representative test of the castings. It may be seen from the limits of variation of the chemical analyses, no special attention or particular care was given these test heats; they were picked at random and they represent the average of good, bad and indifferent ones. In each case the furnace charge was composed of 98 per cent good scrap and 2 per cent new metal.

Likewise the total absence of adhering or burned in sand of the permanent mold cast alloys with their characteristic crispness, promote greater machine ability. These noteworthy improvements in physical properties imparted by the permanent molding process are not only restricted to wearing alloys but also to red brass proper, such as true bronzes and phosphor-bronzes for steam fittings and castings that are subjected to hard wear, high hydraulic pressures and all kinds of heavy duty machine parts, like locomotive valve gears, motor gears and bearings, steam-engine cylinders, hydraulic cylinders, transmission shafts for rolling mills, etc. So, in our opinion, the greatest assets of the permanent molds are to be found not only in their relation to increasing the power of tin to hold more lead but, perhaps in a greater measure, in the improvement of physical properties.

At the present stage of development this comparatively new molding process is more or less shrouded with considerable mystery. There is the over-optimistic class, chiefly among some wearing alloys manufacturers, who claim greatly exaggerated accomplishments with this process in the manufacture of leaded bronzes. There is the over-pessimistic class who see nothing else but an imaginary hard and brittle alloy as a result of this process. Many a foundryman unfamiliar with permanent molds has the impression that their chilling effect must harden and embrittle brass and bronze in the same way as does the chilling of gray iron and high carbon steel. Such, however, is not the case. There can be no comparison between the excessive increase in hardness from the chilling of gray iron and steel and the small increase in hardness from the chilling of brass and bronze.

How Tin Hardens Copper

As a matter of fact the real hardness in simple bronze is above all a direct function of tin. As the amount of this white metal increases, the hardness of bronze increases progressively, reaching its height with a tin content somewhere between 30 per cent and 34 per cent. When the quantity of tin goes above this mark, the reverse takes place. The bronze begins to soften so that by the time its composition is 65 per cent tin and 34 per cent copper it is little harder than pure copper. These facts lead us to believe that copper forms several binary alloys with tin of which the two principal ones are Cu_4Sn and Cu_2Sn_2 substituting chemical symbols by atomic weights (63.57 for copper and 118.7 for tin) we have in formula 1 Cu_4Sn, 254.3 parts of copper united with 118.7 parts of tin to form 373 parts of copper-tin alloy, composed roughly of 68 per cent copper and 32 per cent tin; in formula Cu_2Sn_2, 127 parts of copper united with 237.4 parts of tin to form 364.4 parts of copper-tin alloy composed of 34.85 per cent copper and 65.15 per cent tin. Any other copper-tin alloys that might exist in solid solutions in bronze should have compositions between the limits of copper and tin, respectively, of these two principal binary alloys of copper. The hard Cu_4Sn has the highest melting point; consequently the temperature of its formation is the highest; while the soft Cu_2Sn_2 has the lowest melting point.

It is apparent then that a bronze is hard in proportion to the amount of Cu_4Sn it contains, which in turn

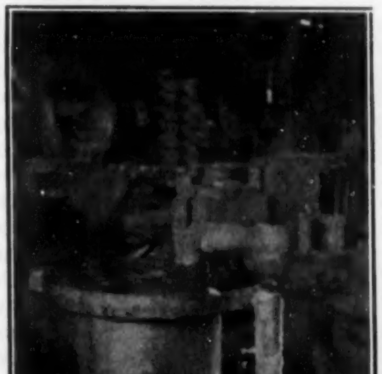


Fig. 2—The Gate and Riser Arrangement of the Flanged Crown Bearing, the Pouring of Which Is Illustrated in Figures 3 and 4

depends first on the quantity of tin in the bronze, and second on the rate of solidification. For, since tin forms hard Cu_4Sn at high temperatures and soft Cu_2Sn_2 at low temperatures it is natural to expect the retention of a larger quantity of Cu_4Sn with rapid solidification so that, the main difference in hardness between permanent mold and sand mold cast bronze of same composition is only in the higher percentage of Cu_4Sn of the permanent mold casting, due to the chilling or very rapid solidifica-

tion of the alloy coincident with this molding process. Since then, the comparatively soft eutectic Cu_2Sn_2 does not contribute much to the hardness of bronze, its total or partial elimination in the chill cast alloy helps to produce the desired hardness with a smaller amount of tin than is required in the case of sand cast alloy.

While the above summary discussion of the effect of tin on bronze hardness was restricted to true bronzes only, that is, to binary alloys of copper and tin, the same is true in the case of leaded bronzes or "wearing alloys." Since lead does not form solid solutions, that is, chemical alloys, with copper but is simply held in mechanical suspension in the bronze as graphitic carbon is held in gray iron, it becomes apparent that the rules and conditions, whatever these may be, governing hardness in true bronzes must be the same ones governing hardness in leaded bronzes or "wearing alloys" of copper-tin-lead composition. (See Table 1.)

Holding Lead with Tin

Many foundrymen of non-ferrous metals specializing in wearing alloys like to believe in his methods of holding the lead in these alloys and preventing lead sweating and segregation at solidification, as his own secrets. Yet, if there is anything that need not be a secret, it is holding the lead in bronze. Of course it is true that copper and lead do not form an alloy, being kept mechanically mixed only through continuous stirring. This is aggravated due to difference in the temperature of solidification and the specific gravity of copper and lead. But when a small amount of tin is added to a bath of copper and lead some of the alloys it forms with copper solidify considerably in advance of lead, into a matrix of cells with hard walls which serve to hold in the still liquid lead, until in turn, it reaches solidification. Therefore, the larger the amount of tin added, the larger the formation of hard walled cells and the larger the amount of lead held in the alloy. Naturally, it is to be expected that the part of tin forming the eutectic Cu_2Sn_2 contributes very little in the holding in of lead since it is comparatively soft and its temperature of solidification is some 500° F. lower than that of the hard Cu_4Sn. Consequently, the power of tin to hold in the lead increases with the elimination of the eutectic Cu_2Sn_2. In other words, more lead can be held in with a smaller quantity of tin when all of it is in the alloy, as Cu_4Sn, than with a larger quantity when most of it is in the alloy as Cu_2Sn_2. The obvious conclusion is that since the chilling effect of the permanent mold causes most of the tin to remain in the Cu_4Sn form (particularly when the quantity of this white metal does not exceed 10 per cent of the copper in the alloy), chill cast wearing alloys can hold in considerably more lead than sand cast ones, all other conditions, of course, such as thickness of casting, remaining the same in both cases.

Tin, though the natural alloy of copper and the best densifier for both brass and bronze, is not however, the only metal that holds in the lead. A number of other metals, such as nickel, chrome, manganese, tungsten, iron and certain metalloids, forming combinations with copper similar to those of tin, resulting in hard alloys, have power, greater or less, to hold in the lead. But in every case the underlying principle is the same, that is, the formation of a matrix of hard cells which solidifies at a much higher temperature than lead, holding this white soft metal in, until in its turn it becomes solid.

Calculations for Mold Design

A typical permanent mold is illustrated in Fig. 1. This is used by the Lenoir Car Works foundries to cast flanged crown bearings for locomotives. It can readily be seen from the illustrations this mold is composed of three main parts. One forms the bore of the bearing; the remaining two, the back and the bottom gate from which the casting is poured. A split top plate with pouring cup and riser made of the same special cast-iron, like all the other parts, completes the mold. It is important to note at the outset that the only machined parts of the mold are the joints; and this, in order to have a close fit to prevent metal leakage while pouring. The thickness of the mold walls are in direct proportion to the mass or weight of the crown bearing the mold is made to cast, and it is determined from the following empirical formula arrived at from practical experiments.

$$\frac{W\ (t-t')}{Pr. \times Rt.} \times \frac{1}{H} = T$$ (Wall thickness in inches) in

which W, represents the weight of the bearing in pounds.

t', pouring temperature of the alloy the bearing is made from.

t', temperature of the bearing at the shaking out.

Pr, time in minutes the bearing is desired to remain in the mold before it reaches the shaking out temperature.

Rt, maximum allowable increase in temperature of the mold after pouring.

H, height or length of the bearing.

It is easily seen from the above formula that on a given

Fig. 3.—Pouring a Flanged Bearing for a Locomotive. The Heavy Stream of Hot Metal at the Start Is Shown

casting weight, the thicker the walls of the mold, the shorter the period the casting must stay in the mold before shaking out, and the cooler the mold will be after the shaking out. This means greater production speed insofar as molding is concerned and a longer life for the mold.

Cooling the Mold

It has been our experience that the hotter the mold gets with each pouring, the shorter its life. In order to cool off the mold to a certain extent after each pouring the inside walls are sprayed with paraffine lubricating oil in which a small quantity of graphite or lampblack has been mixed. This treatment not only cools off the mold considerably but it also prevents the casting from sticking on the walls of the mold.

Dressing clays, cements, or any kind of silicate, should be avoided for, while they may work satisfactorily with permanent molds for aluminum castings, the opposite is true with permanent molds for casting brass and bronze.

The higher pouring temperature and the more "cutting" effect of these alloys cause such dressings to crumble off the mold walls and become incorporated in the alloy, giving all kinds of trouble, from blow-holes to hard spots.

At the beginning of operations and before pouring, the mold is preheated to a temperature around 250° F. and after spraying or brushing sparingly with the paraffine-lampblack mixture it is closed and the component parts are held together by steel clamps as illustrated in Fig. 3. The small wooden wedges serve as springs and allow the various parts of the mold to expand without hindrance. It is a mistake to interlock or otherwise hold the component parts of the mold so rigidly that expansion becomes impossible, for aside from the wasteful expense in machine shop work that such interlocking entails, the result of such a condition would be very probably a mold failure.

Fig. 4.—The Same Mold as Seen in Figure 3 Is Shown Here Near the End of the Pouring, When the Mold Is Almost Full. Here the Stream of Metal Is Light

The mold then is clamped lightly by gently driving the small wooden wedges between the steel clamps and the mold proper, and after pouring is over and the casting in the mold has set past its brittle state, the clamps are knocked down with a light hammer blow, the mold is pried open, the casting shaken out. After spraying, the mold is again clamped as before and ready for another pouring. Compressed air, though far more expensive than clamps, can be used to advantage in holding the mold parts together while pouring.

Melting Practice

Operating permanent molds requires no molding skill or experience of any kind. Molding losses such as are commonly attributed to molder's neglect or inefficiency are altogether eliminated. However, losses from faulty melting are not eliminated by permanent molding, and the fine points of brass-foundry metallurgy and melting skill, forming the essence in quality production, are the same with sand and chill molding processes. In order to produce good sound castings and wearing alloys of lasting antifrictional quality in permanent molds, the alloy before pouring must be in the right shape. It should not be over-oxidized, burned, contaminated with a lot of slag, or cold and lifeless. With regard to pouring temperature, since the chilling effect of the permanent molds causes the alloy to set exceedingly fast, fluidity becomes of paramount importance; the more so when pouring castings of light, thin sections and with wide flanges. The best way to attain this condition is by superheating and pouring hotter, from 50° F. to 100° F., than the customary pouring temperature range when pouring into sand molds. Of course this does not imply that the alloy should be poured far hotter than it is necessary to "run well," for, it must be remembered that erosion coincident with too hot metal goes a long way to shorten the mold's life. Furthermore, such an excess in pouring temperature will produce castings with honeycomb patches. On the other hand we have often witnessed the practice of tapping out a heat cold, then overfeeding it with phosphor copper in order to give it enough fluidity for pouring. Needless to say, such practice is wasteful, in particular in the case of high lead-bronze for locomotive wearing alloy in which evenness of hardness is of utmost importance. Phosphor copper recklessly used causes hard spots which are detrimental to the wearing quality of the alloy, especially when the tin is too low to form a homogeneous matrix.

Another wrong use of phosphor copper along with certain manganese-nickel base fluxes of high sounding names, is made when they are added in a low tin wearing alloy to give it the necessary hardness and hold the lead in. Practices of this type are really a pathetic waste and typical of the false economy of "spending a dollar to save a nickel." To begin with, modern investigation has shown that while residual phosphorous decreases the rate of wear of high tin wearing alloys **it increases this rate of wear of low tin mixtures.** Then again, in order to leave in the alloy enough residual phosphorus for hardness, so much phosphor copper has to be added, as to make the operation far more expensive than the cost of the tin saved. Phosphor copper should never be used, in wearing alloys, in larger amounts than the smallest quantity necessary for deoxidizing purposes. Restricted to this field it is valuable. It is appropriate at this moment to say also in regard to various fluxes with which the

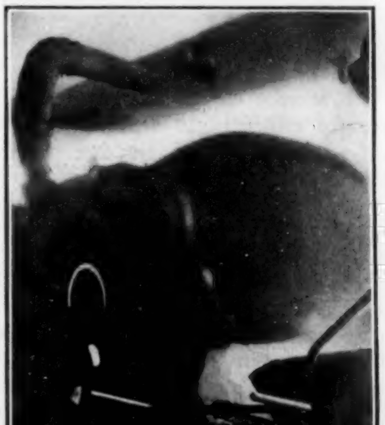


Fig. 5. — Tapping Out a Heat from an Oil - Fired Rotating Furnace of "Monarch" Type

non-ferrous industry is plagued at present, that by careful investigation in our foundry practice we have arrived at the conclusion that the best of them do not cause any worth while improvements on a bad heat.

Bottom Pour Gate and Pouring Cup Riser

Two outstanding features of the permanent molds illustrated in Figs. 1 and 2 which require special mention here

are their standard bottom pouring gate and pouring cup riser combination. Although there is considerable difference in the weight and shape of the various castings, the size of the gate and riser is the same in all of them. The benefit from such standardization lies in the elimination of considerable pattern work for core boxes and top plates; also whenever for any reason the gate freezes, immediately the metal will flow into the mold from the riser and the casting is saved. It may be said of the bottom gate that, while all things considered it is more expensive than a top gate, it affords always the best and safest way to pour a casting, and in the case of permanent molds it becomes almost indispensable for many reasons, chief of which are that it allows the metal in the mold to rise gently and evenly, thus providing a better upward draft for occluded and generated gases from volatile matter in the mold dressing or from any other source. It also eliminates, entirely, severe losses from honeycomb patches coincident with pouring from a top gate.

Correct Pouring

Casting losses with permanent molds become exceedingly few once the peculiar knacks and ways of pouring are mastered. One of these knacks is pouring a mold at

Fig. 6.—Back End Main Rod Brass Floating Bushing and Phosphor Bronze Bushings for Locomotives

the start with a heavy fast stream of metal and gradually slowing down **in a steady continuous way,** until, by the time the mold is almost filled to the riser, the stream of metal is not much larger than a pencil. Any interruptions while filling the mold will cause cold seams on the casting. Too fast pouring all the way will cause draws and heavy shrinkages under the riser, while too slow pouring will cause the metal to cool off and become sluggish, so that the casting will show rough places and corners around flanges. Thin sections and prongs will not be sharp and well defined. As a matter of fact the success of the standard gate and pouring cup riser combination depends entirely on the proper pouring as described above, in order to function correctly and give no trouble. At all times the molds should be kept clean by scrubbing them often with a wire brush to remove any deposited carbon from the spraying mixture and tiny particles of adhering bronze. The cleaner the walls of the mold, the smoother the appearance of the castings will be. All gates and risers are very easily broken off while hot at the shaking out time, so that the only "dolling up" the castings need in the cleaning room is a little rattling and grinding around the gate and riser.

Conclusions

Summing up our experience with permanent molds as applied to the manufacture of bushings and wearing alloys for railroad use, we have no doubt that this comparatively new molding process is far superior to regular sand molding, for it yields indisputable advantages in quality values and appreciable reductions in costs of production. But while the consensus of opinion seems to be that the greatest asset of permanent molds is in their relation to the increased holding power of tin in regard to lead, in our opinion what is of utmost importance is the well-established fact that permanent mold cast alloys with less tin possess an incomparably finer and more homogeneous microstructure of even hardness than the best sand cast alloys with more tin.

It is to be regretted though, that the present tendency of some wearing alloy manufacturers is to abuse these quality improvements and put forth unproved claims, such as that leaded bronze of a 70 per cent Cu, 25 per cent Pb, 5 per cent Sn, composition is as strong as a sand cast composition of 80 per cent Cu, 10 per cent Pb, 10 per cent Sn. It may be that alloys of the former composition are found to be more suitable for certain purposes that heretofore were believed to require alloys of the latter composition. But all in all, keeping in mind strength and hardness, the saving in tin due to permanent molds is not greater than 10 per cent to 15 per cent of the usual amount required for a sand cast alloy. Yet, considering the higher cost of tin, such a saving is of considerable economic importance.

Fig. 7.—General Arrangement of Permanent Molds

With reference to direct costs of production it is perfectly safe to say that the saving between the two processes is from 10 cents to 20 cents per 100 lbs. of castings produced, in favor of the permanent molds; this in the case where the latest sand handling and molding machinery is used. This saving may run up to 50 cents per 100 lbs. of castings produced where and when permanent molds replace sand molding which is mostly done by hand labor.

The Fundamentals of Brass Foundry Practice

A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Work—Part 23*

By R. R. CLARKE
Foundry Superintendent

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Casting Copper

COPPER is a tough, non-corrosive, ductile, malleable, red metal of high heat and electrical conductivity, possessing a marked affinity for a number of different metals. It melts at 1981° F., boils at 4180° F. and oxidizes and gasifies profusely in the molten state, rendering itself an extremely difficult metal to cast sound and clean. It possesses, further, a high shrinking tendency and requires, in the casting, generous feeding at all high and heavy or variable points.

In the melting of copper lies a broad avenue of escape from many of its castings defects, regardless of the type of furnace used, whether electric, crucible pit, air and oil, air and gas. For clean particular work, and most copper castings are particular, the metal should be of high quality such as Lake or Electrolytic, in either pig or cake form. Scrap copper in the nature of baled wire, small cuttings, clippings, etc., is often not dependable and a source of many inferior castings. When it is used care should be taken that the wire, cuttings, clippings, etc., are as free as possible from contamination, oxide, scale, etc. When the difficulties of obtaining clean, sound metal in the cast are realized, it is at once clear that the metal, to start off, cannot have much of impurities in it.

Oxidation and gasification are very prominent in copper. Oxidation results in drossy, scummy castings. Gasification reveals itself in the honeycomb porosity. It can usually be detected in the pouring sprue and riser heads where the metal, in cooling, swells up instead of shrinking down.

To overcome oxidation and gasification, different means are employed. Where the electrical conductivity requirement is not so high, 2 per cent of zinc and a trace of phosphorus can be added without harm. Either of the two, however, will lower conductivity and they are prohibited where such requirements are high. Of those elements corrective of oxidation and gasification, and at the same time lenient with conductivity, silicon added to the alloy in the concentrated form of copper-silicon, is one of the oldest and most reliable. The percentage of silicon varies with the quality of copper, its temperature at pouring and various other factors, and cannot be rigidly given. The safest method in using silicon is to have trial sprues formed in sand as a mold. Add to the copper bath, the approximate amount of silicon copper decided upon and pour one of these test sprues. If the metal sinks in cooling, pour the castings at once. If the metal swells in the sprue, add more silicon copper and try again.

Magnesium is another active agent in making copper castings and interferes less with conductivity. It renders the metal extremely drossy and slushy, however, and has never found favor with the author.

The neutral agents such as sub-oxide, etc., in manipulating copper are non-metallic substances productive of a reaction, degasifying and deoxidizing the metal with no effect on the native metal properties. The substance usually comes in the nature of a powder and is used on the surface of the metal and thoroughly stirred. In different instances the author has found the method to be quite reliable.

Charcoal is one of the most reliable aids in manipulating copper and has always been a prominent factor in the author's practice. In melting, the copper is charged, and a good shovelful of charcoal to 100 pounds of copper added. If the copper cannot all be charged at once, the remaining quota is charged as soon as room for it develops, without delay. After the copper is all reduced more charcoal is thrown over the liquid surface and the metal brought to a comparatively high temperature. It is then drawn from the furnace, the metal surface skimmed clean and a good layer of charcoal thrown over it. It is then hurried to the mold and poured as quickly as possible.

As to the pouring temperature, the author has come to the conclusion that hot metal is better than cold for pouring. The old and widely prevalent idea that a lower temperature escaped the gaseous condition is in the author's opinion, practically disproved by practice; this especially where the reagents, neutral or active are employed.

It would seem that many of the reactions induced by these reagents exert their maximum benefit at higher temperatures and weaken at the lower temperatures. At any rate our own experience has brought us to the conclusion that more clean, solid and less shrunken castings are realized when the metal is poured at the upper range of temperatures.

In some respects copper is an easy metal to mold; in others, difficult. It is not a hard metal on sand, even though it has a higher melting point than the average alloy, and its cutting and scabbing tendencies are up to the average. The metal flows freely at reasonable temperatures and delivers a clean-cut, smooth-surface casting under proper metal conditions. The sand in molding, works best on the dry side and the ramming need not be unusually hard.

Two main difficulties attend copper molding: (1) high and local shrinkage; (2) obtaining clean metal, free of scum and dross of the metal's own making, when delivered to the casting. High shrinkage is an inherent part of the metal and the casting must be fed at all high and heavy points with large gates and risers. Even where the section of the casting appears only a little heavier than its adjoining section, and where in the average alloy no feeding would be considered, copper usually requires it. Wherever bulk in the casting is even slightly greater

* This series will be collected and published in book form. Parts 1 to 22, inclusive, were published in our issues of July, August, September, October and November, 1926; January, February, March, April, May, August, September, November and December, 1927; March, May, August, September and December, 1928; March, April and October, 1929.

or high up, a feeder at that point should not be omitted. A peculiarity of copper (different from many of its alloys) is its inability to feed from a lower point of feed to a greater bulk above it. Figure 75 will illustrate this point. A good sized gate at A would in an alloy like 85-5-5-5, feed up and hold the casting point B against shrinkage.

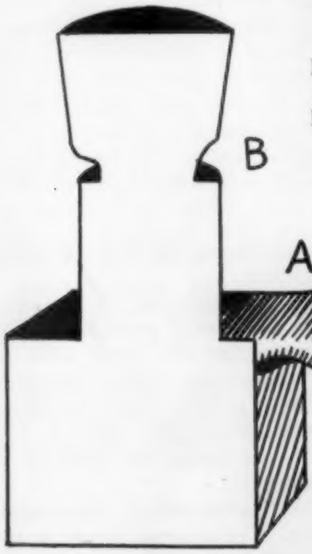


Fig. 75.—Showing Inability of Copper to Feed From Below to a Greater Bulk Above it

In copper, a shrink cavity in section B would be likely to occur with the same gate. To guard against it, a feeding riser over point B should be used.

Another peculiarity of copper is its tendency to congeal in its centers of bulk. This occurs often in the feeding reservoir of a riser and results in an interruption between the feeding metal and its terminus in the casting. Frequently the author has sawed risers off a casting and found a hole under them when all feeding conditions and volumes were ample. Investigation showed that a congealing plane of metal somewhere down in the riser shut off the supply of metal from the casting and left the shrink to develop in the casting as shown in Figure 76.

Fig. 76. (At Left) — Congealing Crust Shutting Off Feed

Fig. 77. (Below)—Congealing Crust on Top of Riser and Shrink Cavity Below It

Often the copper riser top surface will show no shrinkage while a little underneath the surface, heavy shrinkage is in evidence and can be found by sawing the riser in half vertically. This is shown in Figure 77 and explains the fact of the rapidly freezing and oxidizing crust on the riser surface. These peculiarities have an important significance in the risering and feeding of copper castings and show the absolute necessity of large bulk and high temperature in the riser metal to keep the riser to casting channels open so to not deny the casting the metal supply. To this end the form and volume of risers and feeders, as referred to in a previous chapter, should be strictly adhered to and the practice of furnishing the riser reservoirs a supply of metal hotter than the casting metal, will be found well worth observing.

A further safeguard against shrinkage on particular occasions often taken by the author is to cover the top of the riser metal with a thin layer of charcoal to prevent oxidation and crust formation and to "pump" the riser so to break any underlying crust that may form. A copper riser surface covered with charcoal will remain liquid and open far longer than without it. It will furthermore supply a cleaner and purer metal to the casting.

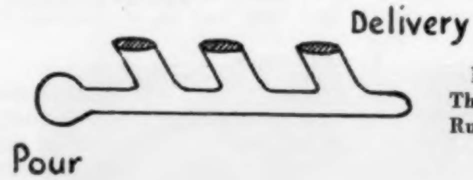
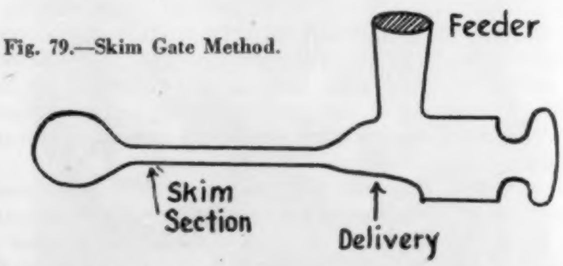


Fig. 78.—Broad, Thin Gates for Running; Risers for Feeding

Gating for running a copper casting is a particular phase of its molding. Some metals and alloys will of themselves run clean, but copper is not of them. It simply must be subjected to some purging influence and a skim gate of some efficient type is a prerequisite of a clean casting. The author observes mainly one of two practices: either to resort to broad thin gates only to run the casting, and delegate feeding to risers not connected with the runner gates; or to have skim gates to the delivery gate and riser, the delivery being at a point close to its union with the casting. Figures 78 and 79 illustrate these methods.

The gating point of copper should be where the metal will be delivered with least commotion and mold punishment.

Fig. 79.—Skim Gate Method.



Mechanical agitation of molten copper works up and releases dross. For this reason a calm, placid delivery of the metal in the mold is desirable. In large deep castings, bottom gating has been found preferable. In this connection, the author has resorted, in different instances, to the drop-pouring method, and taken special pains to realize on its efficiency by scattering charcoal over the bottom of the plugged reservoir, filling to the top of the reservoir with metal, then lifting the plug and keeping the reservoir filled topful throughout the filling of the mold. The charcoal action on the metal in this way began with the beginning of the pour and continued as a surface covering on the reservoir of metal. Results from this method were satisfactory on large and particular castings.

All in all copper molding is a difficult branch of foundry work and can cause much grief by its difficulties. A close study of its nature and requirements along with diligent care in its manipulation will reduce it to a fairly ordinary proposition in the foundry.

This series will be continued in an early issue.—Ed.

A New Electrolytic Zinc

How Zinc Is Produced of 99.99+ Purity by the Tainton Electrolytic Process

By F. S. ELFRED, JR.
Evans-Wallower Zinc Company, East St. Louis, Ill.

AN ADDRESS DELIVERED AT THE CHICAGO MEETING OF THE AMERICAN DIE CASTING INSTITUTE, JANUARY, 1930

History of Zinc

ZINC is one of the three important metals of the non-ferrous group in the world today—and it takes its position along with copper and lead; but it is the last of the three metals to be discovered. History does not tell us when zinc was first produced in the metallic state; but we have reason to believe it was known to the Chinese centuries ago. The Romans made brass from copper and calamine ore before the birth of Christ, but they did not know zinc as a metal. The first mention of zinc as a metal that is recorded, was made by the chemist Paracelsus and the metallurgist Agricola, early in the 16th century, although history indicates our earlist zinc came from China and India as the metal.

The first production of zinc in England was about 1740 by Bergman, who went to China to find out the secret of the art and returned and built a plant at Bristol, England. The zinc industry expanded in Europe and into Belgium, and in 1800 the present Belgium retort process became standard practice and, with mechanical improvements, is the same metallurgical practice used today by the retort smelters. The Englishmen, Hobsen and Sylvester, discovered in 1805 that zinc could be rolled, and to Crawford in 1837, a patent was issued, the first patent for galvanizing. These two discoveries meant much to the zinc industry; for in 1830 the total zinc production was only 5,000 tons annually.

In the United States they attempted to produce zinc from the New Jersey ores as early as 1838, but were unsuccessful. Our first regular smelter was built by J. Wharton in the Pennsylvania Anthracite coal district, and was started in 1859. In 1870, six smelters were operating, producing a combined tonnage of 4,500 tons annually —and New Jersey produced 13,000 tons of zinc oxide,— the world production in 1870 was 128,000 tons. In 1928 the world produced 1,567,414 tons, of which the United States' part was 620,000 tons, or more than one-third.

In 1845 the world used 30,000 tons of zinc; in 1928 the consumption was within 50,000 tons of production. The increase has been steady until 1900—since 1900 the consumption has more than doubled. The increased use of zinc does not mean the replacing of other metals, but arises from the increasing demands of civilization. Although millions have been spent in the production of zinc, little effort and money have been spent in developing new uses of the metal.

Methods of Extraction

The retort method of producing zinc is to mix roasted zinc ore, in which the zinc is present as zinc oxide, with coal or coke in an enclosed fire clay vessel known as a retort, about 5′ long and 12″ in diameter, and expose it to a high temperature about 1400° C., with an excess of coal present. The zinc distills off as a vapor and is condensed to a liquid and poured into casting moulds. This method is used today by the retort smelters. Impurities in the ores from which the metal is made will find their way to the resulting product. Therefore, you can readily understand why our metal, known as prime Western, varies in metal content. The temperature of a retort block is near 1400° C. and zinc melts at 419° C. The vapor condenses at 918° C.

Contrary to general belief, electrolytic zinc was first made about 1883, but little success with a commercial product was obtained and the first product was a black spongy mass which could not be handled. In 1897 a plant was built at Cockle Creek, New South Wales, by Ashcroft. Thanks to constant work by metallurgists, his practice was shaped into the present commercial plant. The spongy zinc was cured by better purification of the solution and acidification of the electrolyte, but difficulties persisted on account of the lack of a proper anode. Even platinum was tried, but platinum dissolved in organic acids present in the solution. Finally, an anode of lead was made possible by higher current densities and is the method now used by most electrolytic zinc plants. Impurities in a solution quite naturally tend to prevent good results and hinder a true cycle process—and the metallurgist is ever trying to obtain perfection by having all impurities out of the solution. This is an impossibility. The methods of removal are never absolutely complete. Therefore, an economic balance must be struck. This field has not been entirely explored today. When it is, it will simplify electrolytic zinc plant operations.

Tainton Electrolytic Process

The latest method of producing zinc is known as the Tainton Electrolytic Zinc Process—and as in the retort process the ore is roasted; but from this point on it is different.

The ore after roasting is sent to a leaching tank and is put in solution with sulphuric acid. The agitators can be of any size, but a tank 20′ deep and 12′ diameter will hold 100 tons of the solution, and will produce 18 tons of zinc per day when high acid strength is used. In low acid work this same tank will only produce 4½ tons of zinc per day. After the ore is added to the tank, it is agitated for about ½ hour and then manganese ore is added to oxidize the iron; this iron first dissolves and later precipitates carrying with it the arsenic and antimony. The solution is tested by allowing a drop of the pulp to fall on a thiocyanate test paper—and as long as iron is present a red ring will form. The time necessary for dissolution varies, but operators make accurate test before drawing the solution. When neutral, the pulp is drawn to the Burt filters, which consists of a steel drum 42″ in diameter and 40′ long, placed horizontally. The inside of the shell is lined with cotton filter cloth which is sewed round wooden boards 20′ long and 9″ wide. The filter is charged and then closed tightly and revolved. Compressed air is put into the filter through the trunnions, displacing the solution. Each filter has a capacity of 15 tons of zinc metal per day.

The liquor from the Burt filters is sent to the purification tank. This solution also contains copper and cadmium, likewise nickel and cobalt. In the purification tank,

copper and cadmium are removed by the addition of zinc dust. An excess of zinc dust is essential to insure complete or near complete removal, because of the tendency of these metals to go back into solution. This step is done with hot solutions to accelerate the reaction. Zinc will precipitate cobalt and nickel from hot solution, but will not from cold. After complete precipitation the solution is clarified through filter presses and sent to the storage tank for feed to the electrolytic cells.

The cell is a rectangular box, lead lined, holding 12 cathodes and twice as many anodes. The solution enters at the center and has a very rapid circulation. The anodes are made from an alloy of silver and lead—and are insoluble in acid. The anode has the appearance of a waffle iron as it has over 50 per cent openings. This is done for circulation; gives reduced terminal voltage and less acid spray in the air. The cathode is aluminum and the active area submerged in the solution is about 28" long by 21" wide. A 24-hour deposit will weigh 45-47 lbs. per cathode. The zinc strips very easily from the cathodes, with a jolt on the floor or knife under one edge it is easily removed. This stripped cathode zinc is then melted and cast in a reverberatory furnace. This operation is done under reducing conditions because of the tendency to oxidize. After melting, it is poured into the moulds familiar to all of you.

Strong acid and high current density metal was considered impossible several years ago. Many obstacles were encountered. Mr. Tainton in laboratory work noted that zinc made from higher current density, which necessarily means greater acid strength, was more dense, smooth and homogeneous. It was this remarkable phenomenon (which like many advancements was purely accidental) which first drew his attention to the practical side of this unexplored combination.

In this process we use 100 amperes per square foot of cathode area and acid strength around 25 per cent. Other methods use 10 per cent acid and 25 to 30 amps. per square foot of area.

It has been stated that high current density would increase power consumption. This has not proven true. The voltage drop is only 3.4 volts across the cell, which is less than with low current density. The electric energy necessary to precipitate 1 ton of zinc is 1760 K.W. hours, theoretically, where no losses are taken into consideration. The losses will vary according to temperature and other factors. Temperature in the cells should be kept below 100° F.

The manganese used to precipitate the iron is recovered in the cell room at the anodes as MnO_2—and can be sold as pure manganese dioxide.

During electrolysis, a colloid, such as gum arabic, is added to the electrolyte to the extent of 1 lb. of gum per ton of zinc produced. Gum or some similar colloid is essential to the production of smooth deposit of zinc at high current densities no matter how pure the solutions may be. It restricts the crystalline growth or formation of trees, which otherwise form rapidly and lower the current density.

The use of high acid strength for leaching gives the following results:

(1) It permits the treatment of zinc ferrite. Therefore increases roaster capacity.

(2) It increases the percentage extraction of zinc by reducing amount of zinc in the residues.

(3) Brings about the solution of a large quantity of iron in the leach. Thus thoroughly purifies the solution from arsenic and antimony.

(4) It improves filtration.

(5) It allows treatment of ore containing relatively large quantities of cobalt and nickel.

(6) It reduces the quantity of pulp to be agitated and filtered—and the volume of solution to be stored and purified, not only in the inverse ratio of the strength of the acid used for leaching, but to an even greater degree, by the elimination of double leaching, double purification, and double filtration.

In high current density there is less variation in the power consumption per pound of zinc, because electrolysis is much less subject to disturbance. High current densities require less electrode area, cell capacity, etc. for a given quantity of zinc as compared with low density.

The mechanical equipment previously used in zinc leaching, etc., has proved inadequate to handle the special problems that strong acid and high current densities present. It has been necessary to devise special methods and apparatus, at a great cost, but without which the commercial operation of the process on many ores would be impractirable.

I should mention that the insoluble anode which is a patent of Mr. Tainton, also deserves its share and merit for the purity of zinc, for any disintegration of the anodes must show its effect on the purity of the cathode. If I have left an impression that the process was easy to work out, I am in error. The first pilot plant was built in Martinez, California, in 1920, and experiment work was carried on at a great expense for two years. In 1923 the work was started at Kellogg, Idaho, which resulted in the completion of that unit in 1928—and the metal has been on the market since that time. Research men are untiring in their efforts to give the users of zinc additional information. We all realize that knowledge is power. It is this knowledge that has given the user of zinc the option to purchase metal of extreme purity. Metal produced under the Tainton process has set a new standard of comparison —and always assays 99.99 per cent or better.

Forged Soldering Coppers

Q. We are manufacturing soldering equipment, such as torches and self-heated soldering coppers heated with city gas and air. Our product is going over good and we want to make our own soldering coppers as we have quite an assortment of shapes and sizes. We are getting a forging machine and the coppers will be forged hot in shaping dies. Now what I want to know is what is the best kind and grade of copper to use to make the best soldering coppers. Should it be hot rolled, hot drawn, or cold drawn? As I understand it, the closer the grain in the copper the better it will stand up. Rather than do a lot of experimenting with this, I thought you could possibly give me this information.

I would also like to know the method used for dipping after forging, to give them a nice clean finish. If possible, send me a formula for such a dip.

A. Hot rolled copper rod would meet all the physical requirements and is in the lower price schedule. It can be bought in sizes from 2 inches in diameter down to ⅜ inch.

The forging process will create a grain structure that will meet all the demands a "soldering iron" is subjected to. To remove the scale or copper oxide after the forging process, use a bath of sulphuric acid and water, about 8 per cent free acid and the balance water. The bath is warmed by the introduction of live steam. A lead-lined tub is used for this work.

After the soldering coppers are pickled clean, wash them off in clear water and dry in saw-dust. A tumbling barrel will do this thoroughly and cheaply.

W. J. Pettis

White Metals, Brasses and Bronzes

A Series of Articles Describing the Types, Constituents, Properties and Methods of Making a Wide Variety of Mixtures as Practiced in a Large Casting Plant—Part 5*

By E. PERRY
Consulting Chemist, Oakland, Cal.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Special Mixtures

SPECIAL yellow brasses are understood to be those containing, in addition to copper and zinc, such metals as aluminum, iron, lead and tin. Aluminum greatly increases the strength of brass and at the same time acts as a deoxidizer. In making aluminum brass, the copper is melted first and the aluminum then introduced, after which the zinc may be added. Lead should not be present in quantity in mixtures containing aluminum. Iron is a great hardener of brass, but is seldom used except in cases where an exceptionally hard brass is required. Lead is a softener of brass and generally induces weakness. It is used in "bushing" mixtures, pump metal, rivet metal, steam pressure cocks, water pressure cocks, etc. As lead does not alloy with copper, it is essential that tin be present in the mixture. Tin is a hardener of brass and at the same time a great toughener; as it produces a homogeneous mixture it is used in the high grade brass and bronze alloys.

As a rule, in all brass mixtures, the copper is melted first and the zinc last. If the mixture is to contain sprue and scrap these may be melted with the copper or added after the copper has melted, in which event the heat must again be raised. As copper oxidizes most readily, the surface of the molten metal should be covered at once with charcoal or some other air-excluding cover, after which the other metals may be put in.

In making aluminum brass the aluminum may be charged in the bottom of the crucible with the copper, or fed in toward the last and using dry zinc chloride as a flux, the zinc chloride being sprinkled a little at a time over the surface of the melted brass. After the aluminum has been added in this manner, the melt should be allowed to stand for a few minutes to enable the metal to free itself from dross.

Many brass founders prefer rye or wheat flour to

* Parts 1 to 4 appeared in our issues of September, November and December, 1929, and February, 1930, respectively.

Table of Representative Brass Mixtures

	Copper	Zinc	Tin	Lead	Brass Scrap	Other Metals
Standard yellow brass	66.60	33.40	....	....	....	
Common yellow brass	45.00	25.00	....	....	30.00	
Malleable brass	70.10	29.90	....	....	....	
Ductile brass	54.00	46.00	....	....	....	
Ductile and malleable	60.25	39.75	....	....	....	
Cast rivet brass	64.00	24.00	3.00	9.00	....	
Tubing brass	70.00	30.00	....	....	....	
Rod, bolt and nut brass	60.00	39.00	1.00	....	....	
Wire mixture	65.40	34.60	....	....	....	
Brass for polished work	59.25	37.00	3.75	....	....	
Sheathing nails	63.60	24.60	2.60	8.70	....	
Hose-coupling brass	50.00	....	5.00	10.00	35.00	
Hose-coupling brass, cheap	16.00	1.00	....	1.00	82.00	
Brass for hammered work	75.70	24.30	....	....	....	
Brass for lathe work	61.60	35.40	.50	2.50	....	
Pale golden-yellow	75.00	25.00	....	....	....	
Deep golden-yellow	60.00	40.00	....	....	....	
Brass for rolling	74.30	22.30	3.40	....	....	
Scrap brass	14.29	7.14	3.57	....	75.00	
Soft casting brass	61.54	34.61	....	3.85	....	
Extra hard brass	79.36	6.35	14.29	....	....	
Fine water-cock metal	81.00	13.00	3.00	3.00	....	
Stop-cock metal	72.00	23.00	....	5.00	....	
Gauge-cock metal	44.00	....	5.00	3.00	48.00	
Steam-pressure cocks	72.00	5.00	9.00	14.00	....	
Water-pressure cocks	84.00	3.00	5.00	8.00	....	
Hard pump brass	70.00	2500	....	5.00	....	
Pump-lining brass	47.00	23.56	5.88	23.56	....	
Pump plungers	64.00	....	8.00	2.00	26.00	
Valve-stem metal	67.14	30.00	....	....	....	2.86 Al.
Marine pump metal	84.00	9.00	3.00	4.00	....	
Hard ferro-brass	60.00	38.50	....	....	....	1.50 Fe.
Full aluminum brass	60.00	32.00	....	....	....	8.00 Al.
Line or wire brass	84.00	10.00	3.00	3.00		
Electric bell metal	78.00	5.00	....	....	....	17.00 (Phosphor-tin)

charcoal as a cover, claiming that it furnishes a better charcoal and is easier to skim off. All brass mixtures after being skimmed should be poured steadily and as quickly as possible. Mixtures high in copper should be poured at a relatively high temperature, and if lead be present the mixture must be well stirred. Mixtures high in zinc should be poured at as low a temperature as possible. With tin present, the pouring temperature may be increased somewhat. A small quantity of boric acid (about a tablespoonful) sprinkled on the surface of a molten alloy high in zinc will generally prevent loss of zinc by burning, and does not in any way interfere with the regular charcoal cover.

Without necessarily being standard proportions for any given purpose, the following table of per cent mixtures are representative of yellow brass mixtures proved satisfactory in composition and cost by some large producers:

Where iron is specified in a formula, iron or steel borings may be used; the iron being melted with the copper. With 25.00 per cent or more of sprue in a mixture, it is advised to deoxidize the melt by adding 2 to 4 ounces of phosphor-copper to each 100 lbs. of metal. Aluminum itself is a deoxidizer, also phosphor-tin, therefore it is obvious that formulas containing them will not need additions of them.

This series will be continued in an early issue.—Ed.

Commercial Production of Lithium

An interesting item on lithium, the light of solid known and a metal valuable in removing impurities from other metals, appears in the April "Industrial Bulletin," published by Arthur D. Little, Inc., Cambridge, Mass. It says:

Lithium is only a little more than half as heavy as water; light enough to float on ether or the lightest gasolene. Cork and balsa wood appear to be lighter than lithium because they contain pores filled with air.

The element lithium is very widely distributed, being found in traces in almost all minerals, but only in a very few is it present in amounts great enough to serve as ores.

The metal has most remarkable chemical activity of a type to make it useful as a "scavenger" in purifying metals. It is said to be able to remove carbon, sulfur, phosphorus, oxygen, nitrogen and other impurities from alloys and pure metals. It is even claimed that if lithium is melted in an iron vessel, the latter becomes so porous by absorption of the foreign constituents by the lithium, that the lithium trickles through it. Also, that when lithium is melted in a glass or quartz vessel, the lithium reduces the silica to silicon, causing the container to crack.

Lithium Alloys

A few hundredths of a per cent of lithium, added to aluminum or its alloys, is said to produce a degree of hardness not otherwise obtainable. Such an alloy is "Skleron." A small fraction of a per cent of lithium added to lead makes a suitable bearing metal. This is the "Bahnmetall" (railroad metal) extensively used on German railways.

The pure metal is very unstable in the air and causes water to decompose at ordinary temperatures. For shipment, the metal is best sealed into tin cans from which the air is removed.

When heated to just above its melting point, 365° F., lithium burns with a dazzling white flame. Its salts, however, color flames a brilliant cherry red. Lithium salts were long but erroneously supposed to be valuable in ridding the system of uric acid, and many thousands of dollars have been spent by rheumatic patients for "lithia waters," the curative powers of which were probably negligible. A fair sized use for lithium salts is in the Edison storage battery, where a valuable service is performed in increasing the electrical capacity of the cells.

Almost simultaneously large scale processes for the production of lithium have been developed recently in the United States and in Germany. A cost of $25 per pound in quantity has been mentioned and if this price can be bettered or even maintained in continued operation we may look for many new and interesting commercial applications.

Preparation of Metal Powders by Electrolysis of Fused Salts. I. Ductile Uranium

F. H. Driggs and W. C. Lilliendahl*

A survey of the literature reveals the fact that meagre data exist concerning the properties of uranium of a high degree of purity. Uranium metal powder was prepared by electrolysis of potassium uranous fluoride in fused calcium and sodium chlorides. The powder was fused to a coherent mass in an evacuated high frequency induction furnace. A chemical analysis of the metal showed carbon (0.06 per cent), iron (0.05 per cent) and silicon (0.01 per cent) to be the only impurities present. Chemical properties of the metal are listed together with its physical constants such as melting point, density, hardness and working properties, electrical conductivity and temperature coefficient of resistance. Samples of this metal are exhibited in the form of wire and sheet.

* Abstract of a paper read before the meeting of the American Chemical Society in Atlanta, Ga., April 7-11, 1930.

Welding Copper to Brass

Q.—We are making brass ring castings for a customer, the composition of which is 85-5-5-5. He machines these rings and makes a number of slots or grooves on one edge in which copper strips are inserted and brazed or welded with Tobin bronze welding rod. They are not used for a bearing but are contacts for an electric machine.

They are having some trouble getting the copper strips to stick and ask that we give them a mixture better suited. What would you suggest that we give them?

A.—We are of the opinion that the mixture of 85-5-5-5 is not at fault but, rather, the brazing rod. We suggest a mixture of 50% copper and 50% zinc be used in welding rod instead of Tobin bronze. We know of a large electric company using this mixture for such work with success.

We know of a bronze solder that is also used for this work. If interested, we can send you the name of the maker.

W. J. Reardon.

Evolution in Automobile Finishes

Progress in Developing Metal Finishes to Keep Up with the Trend of Automobiles

By M. J. CALLAHAN

Chemical Superintendent, Chemical Products Division, E. I. du Pont de Nemours and Company, Parlin, N. J.

A PAPER READ AT THE MEETING OF THE AMERICAN SOCIETY FOR TESTING MATERIALS, DETROIT, MARCH 19, 1930

IN the past ten years probably no product of modern industry has demanded more profound changes in the materials and processes used in its construction than has the automobile. Automobile finishes and their methods of application have been no exception to this general rule; in fact, the changes introduced have savored more of revolution than of evolution. This becomes more apparent when one considers that in the brief space of ten years the basic ingredient of body finishes has been changed to one of radically different chemical nature, that an entirely new technique of application has developed, that entirely new chemicals have been synthesized for use in these new finishes, and that with this new art and change has resulted great economies to the automotive manufacturer as well as benefit of increased service and utility to the owner.

Types of Finishes

For purposes of discussion, it is simplest to separate automobile finishes into divisions based on the part of the automobile to which the finish in question is applied. Such a division comprises body finishes, fender finishes, chassis finishes, engine finishes and accessory finishes. All of these have several requirements in common. They must be easy of application and adaptable to rapid production methods. They should add beauty and style to the parts to which they are applied. They must retain these characteristics unchanged under severe conditions of exposure and service. Underlying and dominating these requirements is the very important factor of time. On the one hand a short time interval of application in the production factory is required and on the other a long time interval of satisfactory service. The problems involved in connection with this time factor have been the principal means of effecting the revolutionary changes which have broken down old methods and traditions. The necessary scientific effort has been tremendous but the results attained have been well worth the exertion.

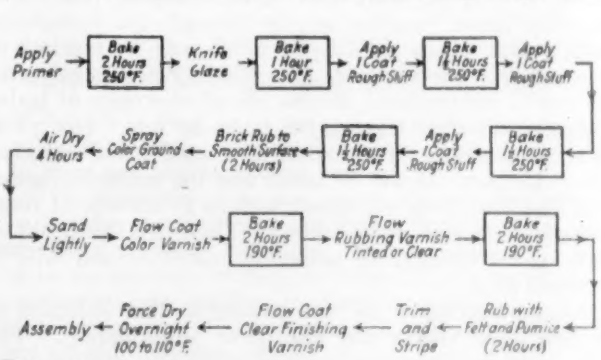
Body Finishes

Of the different types of finishes enumerated, the body finish is of first importance. Second to the interest of an owner in the mechanical details of his machine comes his desire for a beautiful appearance. He is interested in obtaining with his automobile a smooth finish of high luster and beauty, which will be retained for the longest possible period over the useful life of his machine. It requires only a brief span of remembrance to visualize the condition of body-finishing materials and methods of about ten years ago. At that time, as is the case now, the finish on an automobile body consisted of surfacing coats, or undercoats, and color coats. The surfacing coats were in general satisfactory both as to working qualities and service durability, but the color coats were neither satisfactory to the ultimate owner of the car nor to the manufacturer. It was inevitable, therefore, that in this period, the first big step in the evolution of automobile finishes should have occurred with a change in color coats of the body finish.

This step was the introduction in 1923 of color coats of quick drying finishes or lacquers based on cellulose nitrate. Although 1923 marked a turning point in the use of cellulose nitrate lacquers in body finishes, it is little known that lacquers had for some years been used in the industry in the humble role of an oil-resistant sealer for engine and crank case castings. They had also been used to a limited extent in refinishing automobiles on the Pacific coast. The research work which resulted in the development of the type of cellulose nitrate on which could be based automobile finishes of proper durability has been described a number of times and need not be repeated. It may not be out of place, however, to review briefly some of the important results in the automobile industry itself that have followed this evolutionary step in materials and the accompanying changes in methods of production. These results have been manifest in the production shops, in their effect on automobile sales, and in the benefits to the ultimate consumer. Not only that, but they have had further far-reaching effect in unrelated fields of synthetic chemical manufacture.

Effects on Production Methods

Figure 1 is a flow sheet of the method used in finishing bodies of a medium-priced automobile just prior to the introduction of lacquer color coats. The large number of baking operations is notable. These were carried out in so-called box-type ovens. The bodies were all handled on individual trucks requiring hand labor. A very large percentage of marred finishes resulted from this method of handling and the difficulty of effecting repairs even of minor character was great. The consequence was that extra floor space and extra capitalization was tied up in repair work only. In some of the finishing shops where



Total operating time, days .... 4 to 9.
Total hours operating .... 40.
Operating space, 300 bodies per day, sq. ft. ....100 000.
Bodies in production per day .... 1500.
Rejects (painting defects), per cent .... 15 to 20.

Fig. 1.—Flow Sheet, Body Finishing Prior to 1923

lower priced automobiles were produced, a much more rapid system was in force. Primed bodies were flow coated with two coats of black varnish with a baking operation following each flow coat. In such shops the chain system of handling bodies was in force and notable

economies in production costs and space had been obtained. However, this method was limited in the color that could be applied, and served to limit arbitrarily the design of bodies. Practically only open car bodies could be used. The data on which this flow sheet is based is generalized from production work in two plants in operation during 1922.

Figure 2 is a flow sheet of the method now in use in a modern automobile body finishing plant and is generalized from operating data from nine body plants. When the two flow sheets are compared, the tremendous changes that have occurred in body finishing methods are at once apparent. In the first place the time cycle of operations has been shortened so that the body can now be taken from the bare steel to the finished trimmed job in one working day of approximately ten hours. The number of baking operations has been decreased, and particularly in the case of the color coats the temperature of baking has been decreased. The moving chain assembly method of operation has been applied to the whole operation of finishing with the resultant economy in space, labor for handling, etc. It will be noted that the trimming is now

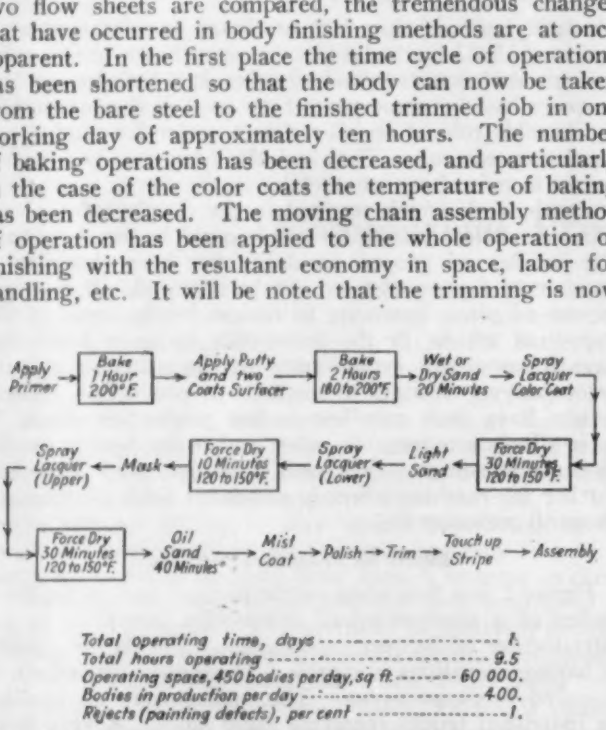


Fig. 2.—Flow Sheet, Modern Automobile Finishing

included with the finishing, and that the final operation is more in the nature of a touch-up and final polishing before turning the body over to the assembly line. This has been made possible largely through the remarkable facility with which the lacquer finish may be touched up or repaired after marring. This facility has largely contributed to the practical elimination of rejections of bodies by inspection after leaving the finishing line. Not all of the space economy noted can be attributed to the introduction of lacquer. It will be noted that the surfacing operations also have been shortened both as to number of times of application and as to baking. These are the result of more recent changes in surfacing materials and will be discussed later.

Naturally a change so far-reaching as that indicated in the two flow sheets did not occur immediately. The methods of handling lacquer evolved as the various automobile body manufacturers adopted it and worked with it. At first there was a great deal of hesitancy in adoption due to the initial higher cost per gallon of lacquers. The economies subsequently realized were not self-evident. However, pressure exerted by the time factor on the old type of finish had become so great that a change was imperative, and once the first step had been made by the General Motors Corp., and the remarkable results obtained in economy of production and durability and improvement in finish shown, the whole industry rapidly changed over to the new type of color coat.

It may be of interest here to speculate as to the possible relation that exists between the increase in production of automobiles over the past few years and the adoption of lacquer. The statement has been made by one very successful body engineer that without the use of lacquer the mass production of this great number of machines would have been impossible. Every one familiar with the industry realizes the difficulties that existed with the use of finishes based on oleoresinous paints and varnishes, such as, their lack of proper drying, their lack of resistance to marring, and their lack of ultimate durability under conditions of service. The first two defects were most prev-

TABLE I.—COMPARISON OF PRODUCTION FIGURES

	1922	1929
Automobiles produced[a]	2,300,000	4,000,000
Floor space for painting (data from Fig. 1), sq. ft.	2,500,000	4,440,000
Floor space for painting (data from Fig. 2), sq. ft.		1,974,000
Space saving (factory space), sq. ft.		2,966,000
Estimated capital investments saved, dollars		20,000,000
Bodies in production (data from Fig. 1)		38,250
Bodies in production (data from Fig. 2)		12,260
Savings in body inventory, bodies		26,990

[a] Exclusive of trucks; includes Canada.

alent during the hotter season of the year and for the past four years the peaks of automotive production have occurred during the hot months. It is conceivable therefore that the statement of the body engineer is not far from the facts of the case. At least some idea of the probable capital investment saving can be made by a comparison of the total number of automobiles manufactured with the data given in Figs. 1 and 2. A comparison of the production figures for 1922 and 1929 with the plant data shown is given in Table I. The point of greatest interest is that actually less floor space is required for finishing bodies in 1929 than in 1922, although the production nearly doubled. The tremendous cut in car inventory during manufacturing also represents a further capitalization decrease that is of great importance and in line with the most modern methods of conducting manufacturing operations.

Effects on Body Design

Not only has the adoption of lacquer contributed marked changes and economies in the production end of the automotive industry, but it has also opened new fields to the design and sales departments. As mentioned previously the older methods of finishing bodies had arbitrarily limited their design and treatment. With the exception of the higher priced cars, body design in 1922 was limited largely to open models. This was due in large measure to the necessity of fitting the design to production finishing methods, particularly flow coating. With the use of lacquer it became possible to finish economically practically any type of body design. This was due to the fact that lacquers are applied by spray methods and also to their rapid setting and drying qualities. The way was opened therefore for the body design engineer to introduce into manufacture new ideas of line and color treatment, until today we have all the bright flashing colors of our highways, with the more intricate details of color harmonies in belts, moldings, tops, window reveals, etc. The use of closed car bodies and their almost univeral adoption would have been practically impossible without the availability of lacquer.

Sales Effects

Hand in hand with this development in design has gone the use of color in sales work. A new type of service called color advisory service has developed, whose function is to try to stimulate sales through the selection of properly harmonizing color combinations, which will not only be

subtly attractive to the eye, but which will actually serve to effect change in appearance, particularly the length and the height of the body of the car. Complaints on finish, that terrible bugaboo of the sales department, in the days of oleoresinous types of finish have practically disappeared. At the present time, the sales department is able to place the product in the hands of the dealer in perfect condition so far as finish is concerned. If injuries to the finish are incurred during shipment it is a simple operation to repair the damage, and a simple polishing operation will restore the finish to its original condition. It is not an overstatement of the fact to say that the use of color made possible by the development of lacquer finishes for automobile bodies has been one of the main contributing causes to the increasing color consciousness of the consuming public.

Consumer Benefits

Not the least important of the changes introduced by the adoption of lacquer has been the durability imparted to the automobile finish under conditions of service. In contrast to the older finishes based on oleoresinous paints and varnishes, a modern lacquer properly applied will not change color, crack, craze, or peel during the life of the car. Some disintegration of the surface occurs during service, but the original luster and brilliancy can be restored by a slight amount of rubbing with a polish containing a mild abrasive. This disintegration varies with different shades both in intensity and type and is much more pronounced in the tropical regions such as Florida and the West Indies. Practically any shade of color can be produced. At the present time, in the more expensive cars, it is possible for the customer to specify his own color combination on a custom built body and for the production factory to carry out the manufacturing operation with practically no more difficulty than is experienced with the standard methods. The resistance of a lacquer coating to scratching is particularly valuable to the car owner. It enables him to wash or wipe off the finish with no particular precautions and bring back the original appearance of the car at the time of purchase. The expensive operation of repainting a car every year has also been eliminated with the consequent savings to the car owner.

This article will be concluded in an early issue.—Ed.

Oxide Finish on Aluminum

Q.—We are desirous of putting an oxide finish on aluminum alloy castings by "deplating." We understand that an oxidized finish can be produced in this way. Our work is made of 95 aluminum, 5 silicon and a trace of copper, in ornamental castings for buildings.

A.—There is no "deplating" method by which an oxidized finish can be obtained on aluminum.

An oxide film can be put on aluminum by making the aluminum the anode in a 3 per cent chromic acid solution. This oxide coating can be colored with aniline dyes. The film can be scratched easily and therefore the work should be given a good coating of clear varnish.

To produce the oxide film the work, as stated, is used as the anode in a 3 per cent chromic acid solution using an increasing voltage ranging from 0 to 40 volts for 15 minutes; then hold at that voltage for 35 minutes; increase to 50 volts in 5 minutes; then hold there for 5 minutes. The process takes one hour. Copper-aluminum alloys are used. Aluminum-silicon alloys will not receive a good oxide coating.

E. E.

Tinning Steel Sheets

Q.—We have tried to pulverize tin by the method recently explained by your expert, but have not gotten the desired results.

Probably we did not explain fully enough. We intend to tin large sheets of steel. The only way of doing this that we know is to have the tin in powdered form and to sprinkle this over the sheet of steel after the preparations have been made, and then to rub the tin on while it is being heated. In this method, of course, the tin would have to be a fine powder.

We know of one place in our city that is doing this work and has the tin in the form mentioned.

A.—We have no knowledge of tin being produced in the finely powdered form, except by mechanical means, nor are we familiar with the method of applying tin to sheet steel as described in your letter.

In the copper sheet mills, where the demand for tinned sheets is largely for sheets tinned on one side only, the tin is applied by the hot tinning method. The process consists of first applying a flux evenly over the sheet, this being generally a chloride of zinc commercial preparation, which can be bought ready to use. The sheet is then placed on an inclined table with top made of sheet iron with raised sides, the lower end resting on the edge of the tin pot. The "tinners," one on each side of the pot, working together, then ladle the hot tin onto the sheet, throwing the tin toward the top and working toward the tin pot. This is continued until the sheet is covered, the surplus tin running back into the pot. The operators then each take a swab made of tow and wipe the sheet from the top down, and repeat this wiping down with "clean" swabs, made of the same material. This leaves a smooth coating of tin on the sheet. These operations must be performed rapidly to insure success.

This is a skeleton description of the above operation. If it will apply to your problem, we will furnish such details as you will require.

We would suggest that you get in touch with one of the tin sheet mills who specialize in this work and see if the sheet steel, ready tinned, can be purchased advantageously.

W. J. Pettis.

Cadmium Plating Aluminum Castings

Q.—We are trying to develop a satisfactory process for cadmium plating aluminum castings, and would be glad to have any assistance that you can give.

A.—The statement does not cover the ground sufficiently to give us any line on the difficulties you are having in depositing cadmium on aluminum. There should be no especial difficulty in cadmium plating aluminum, provided the surface is properly prepared. Any of the formulas given in past issues of The Metal Industry should be satisfactory.

After the castings have been freed from sand it is desirable either to sandblast them to slightly roughen the surfaces or to dip them for 20 to 30 seconds in a ten per cent hydrofluoric acid pickle, then rinse, and hang immediately in the cadmium bath. Plate at two to three volts and use about twenty amperes per square foot. We would suggest the following solution:

Cadmium oxide	2½ to 3½	ozs.
Sodium cyanide	5 to 8	ozs.
Caustic soda	1½	ozs.
Water	1	gal.

Oliver J. Sizelove.

Electroplating Research Progress

A Report of the Electroplating Conference Held at Rochester, N Y., March 22, 1930

FOR several years conferences on electroplating problems have been held under the auspices of the American Electroplaters' Society and the Bureau of Standards. These were held in Washington until 1929, when the meeting was held in Newark, This year the conference was held in Rochester, N. Y., and was well attended.

A—Sylvester Gartland Presiding

The first session was devoted to industrial plating problems.

1. **Automobiles.** W. M. Phillips of the General Motors Corporation reported that, partly as a result of the competition with stainless steel, the total thickness of copper and nickel plated on steel prior to chromium plating had been materially increased, and is now usually from 0.0008" to 0.001". An increase in the present thickness of chromium (about 0.00003") is not advantageous. It would be better still to increase the total thickness of copper and nickel to about 0.002". The cost of steel with such coatings is much less than that of stainless steel. In nickel deposition at high temperatures and current densities, a very low pH, for example from 1 to 3, gives a wider range for good deposits. The solutions with a pH of 3 or less are practically free from suspended matter. Initial pitting can be overcome with hydrogen peroxide. A plea was made for a better quality of steel. One cause of failures of chromium plating on automobiles, is the use of calcium chloride for snow and ice removal. It is more corrosive than sodium chloride, as it is not only hygroscopic and stays wet, but it also hydrolyzes to liberate hydrochloric acid.

2. **Aircraft.** M. R. Whitmore of the U. S. Air Corps at Dayton, stated that on steel aircraft parts, either 0.001" of zinc or 0.0003" of cadmium is used. The cadmium is especially good for dimensioned and threaded parts and for marine exposure.

On aluminum alloys plating has not been extensively applied. The oxide films such as are produced by anodic treatment in dilute chromic acid are especially valuable for holding films of grease or lacquer, which protect against corrosion. The oxide films may also be dyed. Aluminum castings may be protected by dipping in 25 per cent sodium silicate solution, and then baking for 30 minutes. "Alclad" metal consists of duralumin coated with a layer of pure aluminum, applied by rolling. It is only available in sheets.

The speaker concluded that more work should be done on the relation of accelerated tests, such as the salt spray and intermittent immersion, to the actual protective value of zinc and cadmium; and on the factors that affect the value of the aluminum oxide coatings.

3. **Hardware.** R. E. Hicks, of Yale & Towne Manufacturing Company, stated that they have practically overcome stain spotting by allowing the plated articles to stand a few days before finishing and lacquering. The porosity has also been decreased by changes in the patterns. In the discussion, the use of burnishing instead of buffing was suggested as a means of closing the pores.

Crystal spots are now infrequent, as sulphur is excluded by an oil film. There is also less danger of sulphur gases in the holds of oil-burning steamships than in the coal-burning vessels.

For nickel plating on die castings, satisfactory results are obtained with solutions containing sodium sulphate. Chromium has proven valuable to increase the life of taps and dies used for cutting non-ferrous metals.

A reference to the cleaning of metals led to an interesting discussion regarding the removal of grease and buffing materials. Cleaning with oil or turpentine at 250° F. was mentioned; and also the application of "red oil" to facilitate removal of kerosene or similar oils in the alkaline cleaners. "Vapor cleaning," by condensing vapors of liquids such as trichlorethylene on the metal surfaces, was also described.

4. **Silverware.** F. C. Mesle, of the Oneida Community, described the methods used for plating 18 per cent nickel silver. He pointed out that the following problems are in need of study; (a) Better and more rapid cleaning methods. (b) A means of controlling the carbon bisulphide content of "bright" solutions, and an explanation of its effects. (c) Control and measurement of metal distribution. (d) Control and measurement of hardness of the deposits. (e) The irregular corrosion of silver anodes. (f) The comparative value of sodium and potassium cyanides. (g) The effects of carbonates and other salts.

A discussion of "non-tarnishing" silver included the addition to the silver of cadmium, zinc, gold, and platinum. A cathodic treatment in dilute chromic acid was reported to retard the tarnishing.

B—G. B. Hogaboom Presiding

In the session devoted to reports from research laboratories, the following subjects were discussed:

5. **Researches at the Bureau of Standards.** W. Blum summarized the work in progress, including (a) the protective value of chromium plating, (b) pH measurements with a glass electrode, and (c) miscellaneous activities of the section. Owing to several resignations, the research work, both by the Bureau staff and by Research Associates, has been seriously interrupted. Steps are being taken to fill the vacancies and to continue the researches.

6. **Analysis of Silver Plating Solutions.** R. M. Wick, of the Bureau of Standards, reported the results of a study of methods of determining (a) free cyanide, (b) total cyanide, (c) silver, (d) carbonate, and (e) chloride in silver plating baths. In each case the methods were studied with respect to their value for research work and for plant control. It is hoped to publish the details of the methods in the near future.

7. **Plating on Zinc and Die Castings.** E. A. Anderson of the New Jersey Zinc Company, discussed the methods of plating nickel on zinc and zinc base die-castings. The use of chlorine was suggested to coagulate grease suspended in the alkaline electrolytic cleaner. Dipping in 1 per cent hydrofluoric acid just before plating was found to promote good adhesion of the nickel. The latter is usually deposited from high sulphate baths.

Nickel and chromium can be stripped from zinc by a reverse current in concentrated sulphuric acid containing a small amount of glycerine. Chromium can be plated directly on zinc die castings, but only in a dull form. When this is buffed, it furnishes excellent protection against corrosion, and is now used commercially.

The outstanding problems are (a) improved methods of cleaning, and (b) the production of softer nickel deposits with a thickness of about 0.0004".

8. **Deposition of Zinc-Cadmium Alloys.** C. J. Wernlund, of the Roessler & Hasslacher Company, described in detail the production of deposits containing from 10 to 15 per cent of cadmium and the balance of zinc. The cadmium serves as a brightener, and produces coatings which are harder than either zinc or cadmium, and which yield nearly as good protection in the salt spray as pure cadmium.

The deposits are made from "high alkali" zinc cyanide solutions, to which a small amount of cadmium oxide is added. The anodes consist of an alloy of zinc and cadmium in about the proportions desired in the deposit. The composition of the deposit is affected by the bath composition, including the content of free alkali, the temperature and the cathode current density.

9. **Plating Researches in American Universities.** A report, compiled by W. Blum, showed that researches on electroplating have recently been conducted, or are now in progress in at least fourteen institutions, including Brown University, Columbia University, Cornell University, University of Indiana, Massachusetts Institute of Technology, University of Michigan, University of Minnesota, College of the City of New York, University of Pennsylvania, University of Pittsburgh (Mellon Institute), University of Toronto, Vanderbilt University, Washington University, and the University of Wisconsin. Through such researches, many of the problems of plating are being solved.

C—R. J. O'Connor Presiding

Research Fund and Plans

The report of the Research Fund by Philip Sievering showed that there is now a balance of about $2000. It was announced that immediate steps will now be taken to secure new subscriptions for a three year period. The platers and chemists were urged to cooperate with the committee in every possible way. Just as soon as the funds and subscriptions warrant, one or more research associates will be engaged to continue the study of the protective value of chromium and other plated metals.

It was also suggested that the Society should, as soon as feasible, adopt definite standards for plating and methods of test. Such standards may be revised from time to time as new information warrants. The research committee will take steps to prepare such standards in cooperation with the Bureau of Standards, American Society for Testing Materials, and other interested organizations.

The large attendance at this conference, including persons from many industries and from distant points, and the active discussions of various problems, shows that there is a need and demand for research on electroplating. The American Electroplaters' Society and the Bureau of Standards will make every effort to meet that demand. To do so, additional funds are needed. These may be subscribed by individual firms, for example, in amounts of $50 per year for three years; or by groups or associations that desire research on the plating problems of a particular industry. Interested firms or organizations should communicate with the Research Committee, R. J. O'Connor, chairman, 41 Bancroft Avenue, Bridgeport, Conn., or Philip Sievering, 20 South Crescent Street, Maplewood, N. J., secretary.

Those desiring information on publications on plating should address the Bureau of Standards, Washington, D. C.

Recovering Precious Metals from Solutions

Q.—We have been in the habit of putting all our plating room wastes in a barrel, including old solutions, strips, etc., and sending them to the refiner.

We find that at times the refining barely pays. Could you advise us as to what could be put in the barrels to precipitate all the precious metals so that we could syphon off the surplus water?

A.—Metallic zinc will precipitate all the precious metals, even from cyanide solutions. The best kind of zinc for this purpose is zinc shavings, often sold as "zinc shavings for cyaniding," since that is the form used by gold mines in recovering gold from their dilute cyanide solutions. Zinc shot is often used, but the shavings are better.

Stir the barrel often for a short time, say a dozen times a day for two or three days, until you are sure the precious metal has all precipitated. Then, without waiting, syphon off the liquid and throw it away. (If allowed to stand, the precious metals will gradually re-dissolve in the solution, and your efforts will be wasted.)

It often happens that refining this kind of material does not pay. The reason may be one of several. Sometimes, as suggested above, the precious metals have been allowed to redissolve, and the liquid containing them has been thrown away.

Sometimes the mistake lies in dumping too many worthless solutions into the barrel. The returns that come back from the refiner are, naturally, the difference between the value of the gold recovered and the amount of money he had to spend in order to recover it. If the barrel contains a large proportion of worthless material, such as iron, lead, copper, etc., the refiner will have to spend so much time, chemicals, etc., to recover the gold, that it will eat up the value of the gold.

JEWELRY METALLURGIST.

Threading Monel Metal

Q.—We are having considerable trouble with Monel metal on which it is difficult to cut threads with taps or dies, the metal having a tendency to tear. Have used different lubricants and lard oil. What do you suggest?

A.—A very adherent lubricant is necessary. A thin paste of red lead and lard oil will cling to the threads being cut and make an excellent lubricant for this work. The paste should be thin and "runny" and is applied with a brush.

When finished, the taps, chasers or dies should be cleaned by washing in kerosene. Taps and chasers should be ground specially for cutting threads on Monel, and the same tools should not be used on Brass.

P. W. BLAIR.

Newark Branch Meeting

Annual Meeting and Banquet of the Newark Branch of the American Electroplaters' Society

THE annual open meeting and banquet of the Newark Branch was held at the Elks' Club in Newark, N. J., Saturday, April 26, 1930. The technical session was opened at 3:30 p. m., with Horace Smith, president of the national society, in the chair. Mr. Smith made a few announcements concerning the progress of the national society and the coming annual convention in Washington, June 30-July 3, after which he turned over the chair to Philip Sievering, who presided throughout the session.

The first speaker was Dr. E. B. Sanigar, who spoke on the subject of "A Study of Silver Solutions for Electroplating," illustrating his talk with lantern slides. Dr. Sanigar is now at Columbia University as the Weston Fellow of the American Electrochemical Society. For several years past he was engaged in studies on silver deposits at Sheffield University, England. Dr. Sanigar explained the mechanism of silver plating, showing how it differed from the general theory and described a number of practical experiments in silver deposition, comparing sodium cyanide with potassium cyanide, and pointing out the effect of carbonates in the solutions.

E. A. Anderson of the New Jersey Zinc Company read a paper on Four Factors Governing the Plating of Rolled Zinc and Zinc Base Die Castings. These factors are briefly as follows:

1. Polishing. It is necessary to get a perfect surface before plating. For that reason it is not advisable to use greases or abrasives, in the preliminary polishing, which demand strong cleaners to remove them, as strong cleaners will pit the die castings and render them unfit for plating.

2. Cleaning. A mild cleaner is the best. Mr. Anderson recommended 6 ozs. trisodium phosphate in a gallon water, operated boiling hot as an electro-cleaner. He stated that many commercial cleaning preparations were also suitable.

3. Acid dip. A good acid dip is useful because it neutralizes the last of the cleaner which may remain after washing and it also etches the surface slightly. He mentioned several possible dips, such as 5 to 10 per cent HCl; 20 per cent acetic acid; 1 per cent of commercial HFl.

4. Plating. Mr. Anderson advised plating nickel directly on zinc for the primary coating. After that, any coating could be put on. He recommended the sodium sulphate solution consisting of single nickel salts 10 ounces, anhydrous sodium sulphate 15 ounces, ammonium chloride 1.75 ounces, boric acid 2 ounces, water 1 gallon. (A complete description of Mr. Anderson's methods will be found in BRASS WORLD for April, 1930, pages 38-40.)

George B. Hogaboom, in the discussion, pointed to some possible objections to the hydrofluoric acid dip, stating that it might cause rough deposits. It might also result in the formation of nickel fluoride, which, being only very slightly soluble in the plating solution, would cause polarization at the anode and cathode. He pointed out also that in the plating solution it was often advisable to increase the chloride content.

Dr. A. K. Graham of the University of Pennsylvania read a paper, illustrated by lantern slides, describing the methods used at the University of Pennsylvania laboratory, for restoring ancient silver and bronze ornaments, found by the University expedition in the Holy Land. The silver articles were composed of about 80 per cent silver and 20 per cent copper with numerous impurities; the bronzes were approximately 90 per cent copper, 10 per cent tin, also with impurities. These ornaments, in a very badly corroded state, were restored by electrolytic methods. The bronzes were changed from copper compounds (products of corrosion) to metal by making them cathodes in a very dilute caustic soda solution. This process was very slow, of course, taking in some cases up to several months.

The silver deposits were electrolyzed in similar fashion for about a week and this was followed by boiling in a 10 per cent formic acid solution from two to four hours, after which the crusts might be gently removed without injuring the metal. Very small objects, like beads, were handled chemically throughout, as they could not be racked for electrolysis. They were treated first in a 50 per cent ammonia solution and then boiled in formic acid.

The banquet, following the technical session, started at 7 p. m. An excellent menu was offered to the large number of members and guests present, and this was followed by dancing for which two orchestras furnished the music, and very good entertainment. A number of prizes and souvenirs were distributed and among the lucky ones were Mrs. G. Reuter who won a $100 prize, and Benjamin Popper, who won a $5 prize. The party adjourned after a very worth while and enjoyable day.

Rubber on Iron

Q.—In the shop where I am employed we have experienced considerable trouble in getting a semi-soft rubber to stick to iron base. We have tried various platings, brass and copper, but with little success.

Could you recommend a good plate on the iron base to get adhesion between the rubber and the base? We use a cement over the plate before applying the rubber, but the cement seems to stick to the rubber and the plating to the iron base and the cement and plating do not adhere.

A.—A great deal of difficulty has been experienced by the motor truck manufacturers in securing motor truck tire adhesion where the tires are cemented to the rims. The problem has narrowed down to finding a metal coating for the rims that will give perfect adhesion between the rim, the cement and the tire. One of the largest tire manufacturers has succeeded in securing these qualities by sandblasting the face of the rim and brass plating in the following solution:

Copper cyanide	3 oz.
Zinc cyanide	2/3 oz.
Sodium cyanide	8 oz.
Water	1 gal.
Voltage	3 to 3½

For easy maintenance of the solution, electrolytic copper anodes are used. This leaves only zinc cyanide to be added when metal additions are needed. Keep the accumulation of sodium carbonate to low limits by freezing it out.

—WALTER FRAINE.

A Brass Foundryman's Progress

How a Boy Grew Up to Be a Brass Foundryman. His Adventures, Joys and Sorrows, as Told to William J. Reardon. Part 3.*

By OTTO GERLINE
Gerline Brass Foundry Company, Kalamazoo, Mich.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

DEAR Billy:

Several days ago about forty Federal officers paid our city a friendly visit. While here they collected about as many bootleggers, (including mine). As I have a little of the forbidden beverage left I thought perhaps I had better write another chapter of our "best seller" before it is all gone. As this is my "broker's" fourth offense, the chances are that he will be absent from the city for some time to come. Oh well, I am going to Florida for the winter anyway. They are not so particular down there about the stuff.

You know, Billy, if I take a few drinks of that stuff I can write better, my memory is better, and the world looks brighter in general. My wife said to me, "Otto, you better find out what people think of your story before you write any more of it." "Well," I said, "they are printing it, ain't they?"

No one has written to me as to whether it's good or bad, and no news is good news, as the old saying goes. Oh yes, one did write to me. Fred B. Stevens of Detroit, the grand old man of the foundry supply business wrote to tell me that he would read it "after Sunday School." He has, however, not said or written a word about it since then. I believe Fred is too much of a gentleman and Christian to tell me what he really thinks about it, and so he says nothing. I have always admired Fred, and now I admire him much more. He is letting me down easy.

Otto Gerline

I sincerely hope THE METAL INDUSTRY will not lose any of its subscribers by printing it, and I am sure that when I get into my brass foundry experience I will have some interesting things to say.

In the meantime I get a great kick out of throwing my memory back forty-five years or more. Some of my experiences in those days looks funny to me now, but I am sure they did not look so funny to me then.

As stated in my last letter, my next job was peddling milk. Two dollars per week and board was the salary. I had a room in the attic. That is to say the attic was one large room and my bed was up there among the extra milk cans, apples, nuts, the smell and what have you. You could see daylight through the roof so I was not afraid of not having enough fresh air. In fact the snow would come in through these cracks and cover my bed and my clothes. The weather was below zero at the time. The chimney running up through the attic was the only heat. It was a nice cool place.

We had five horses and some pigs, but no cows, excepting one in the front yard with a handle on it, and believe it or not, I have seen it used to help out on a shortage of milk. The man I worked for bought his milk from the surrounding farmers. My job was to get up at 3:00 A. M., feed the horses and clean them while they were eating. I would then hitch up my team and collect the milk at the different farms. The boss would then divide it while I would eat my breakfast. He would then supply me with tickets and small change, and the trip to town was then in order.

You know in those days we had no bottled milk. We carried the milk in large cans, and used a smaller can equipped with a snout, and a quart measure hanging on it for delivering to the customers. I didn't have any more clothes than the law allowed in those days, and I will bet money that Commander Byrd was never as cold at the North or South Poles as I used to get. However, I did well at the game. My instructions were to measure out a pint or quart, and then pour a little more into the pitcher or vessel for good measure.

Most of the time I had some milk left to bring home, and this was used up to make butter, cheese, etc. I noticed that the boss never measured the milk returned, and so I began giving my customers better measure. Of course, one woman would tell another about the good milkman, or "milkboy" she had, and business picked up. In fact I nearly doubled my customers in a very short time. About this time the boss made up his mind to find out how I got so many new customers while he lost some on his route, and so one morning he told me to take his route, and he would take mine. This idea of his got me into trouble. He didn't give as good measure as the "boy," and they were not backward in telling him so. I heard him talking the matter over with his wife that evening, and I surmised that my resignation would shortly be asked for. Sure enough, the following morning when we were all ready to go to town he told me to take all my clothes along, as he couldn't afford to keep me any longer. His brother-in-law took the route I had and I was out of a job in the middle of the winter. He told me I had nothing coming for the last week and that ended my experience as a milkman.

I become a painter next. I got a job at Mr. Brown's paint shop at 75 cents per day, 12 hours, washing buggies, carriages and wagons, scraping grease from the hubs, or wherever it was found, in fact getting them ready for a paint job. I advanced very rapidly here. In two weeks I was given a paint brush and was allowed to put the priming coat on some of the cheaper jobs. In another week I was permitted to put on the second, and even the last coats, on wagons only. In fact I was a carriage painter.

You know, Billy, in a jobbing carriage paint shop there is one guy that is the whole works, the striper. He

* Parts 1 and 2 were published in our issues for July and November, 1929.

holds about the same position as a brewmaster holds in a brewery, or head roller in a rolling mill. Well, I watched this fellow do his stuff, and I made up my mind to become a striper. The white overalls, and white cap appealed to my kid imagination. I began to practice on boards, on shingles, on the walls, and even on wagon wheels.

At about the time I thought I could do striping, a Mr. Charles M. Reed, a very wealthy man, had a carriage repainted, and it was to be the best job we could do. It was a beautiful job and the striper was doing a nice job of striping and putting some very nice "curlicues" and scrolls in places where they belonged. He had the front, rear and one side completed by noon. This left one side to be done and while they were out to dinner I undertook to surprise them. **I did. They also surprised me.** I was very busy striping when I heard the door open and someone hollered, "Say, what in hell do you think you are doing?" I don't dare to put the balance of the remarks down here. Mr. Brown turned white, and so did I. The next thing I knew I found myself outside with several sore spots caused by coming in contact with their feet. Both of those big stiffs took a crack at me. I had really done a good job of it, striping, I mean; at least I thought so at the time. Of course, the lines were not as delicate or as straight as they should have been, and the scrolls and "curlicues" had more or less unnecessary curves and corners in them. I will admit it was not as good a job as Charlie Wilson had done on the other side, but it was good for a fellow that had worked at the trade only eight weeks. And what difference did it make anyway? You couldn't see both sides at once, and Charlie had done the right side (or getting-in-and-out side.) Of course, at the time I didn't think what it would mean to do this, but they had to do the job all over again. I had five days pay coming to me, but Mr. Brown absolutely refused to pay me for them. That settled that. I certainly was very much put out over it. Had he approved of my job and encouraged me I might have become a second Michaelangelo, or a Raphael or a Whistler, or even a good barn-painter. It is hard to say how high I may have risen in the profession if Mr. Brown hadn't been so darn particular.

About this time I made up my mind to go to New York to visit my Mother's sister and Aunt. I must tell you about this. You know my Mother had an idea she would not live to be very old, and time and again she told me that if God would take her, as she put it, I should go to New York and tell her sister that it was her last request that she should help me. I went to New York all right and believe it or not my Aunt received me all right. "But How!"

P. S. I nearly forgot the best part of my milkman experience. "The Customer I Lost."

I had a customer living on 24th street, the family consisting of the man, about sixty years old, the woman about 18 years old, and a baby about six months old. It was the man's third venture into matrimony. There were no children by the first two wives, and believe you me when I tell you that this young baby was the cat's meow, and nothing but. There is no fool like an old fool. I know this by my own experience with my granddaughter. Well, anyway, it was customary, when no milk pitcher was in sight, to holler "Milk," at the top of your voice, so people could hear you and produce this necessary article, if they wanted milk. This is what I did at this man's home one Sunday morning. After several yells without results I walked up on the porch, tried the door, and found it open. I stepped inside and let out one more Apache yell, "Milk" and this time I got results. I was determined to have these people get their milk. The baby heard me and tried to imitate me. It let out a yell and so did Mr. and Mrs. It seems that the baby had been cross and fretful all night, and the father was up with it a good part of the night. Towards morning baby quieted down and went to sleep. So did the lord of the mansion. Everything was serene until I came along with my Apache voice, and spoiled everything. They both tried to quiet the baby and they finally succeeded. The man then came down stairs, three steps at a time, took me by the collar and seat of my breeches, and ran me out of the room and off the porch, out into several feet of snow, milk can, milk and all. The milk spattered all over me, and froze on my clothing, and I was a nice looking little milkman, and I don't mean maybe.

When the boss asked me why these people didn't take milk from us any more I told him that the baby must have Eagle Brand condensed milk for a while, so the Doctor said. This is the only customer I lost and thought perhaps it was worth mentioning.

Business Basis Sound as First Quarter Ends; Upturn Forecast

SOUND business and industrial conditions as the first quarter of 1930 comes to an end are reported by the National Business Survey Conference, headed by Julius H. Barnes, who is also chairman of the Chamber of Commerce of the United States. As regards the metal industries, Harold C. Smith, president of the National Metal Trades Association reported at the annual convention of that body last month the replies to a questionnaire sent to 600 plants throughout the country, showing a major number are doing business ranging from fair to excellent, while less than one-quarter reported poor business.

According to the National Business Survey Conference report, business is looking up. Three salient factors of the report are:

Large American industry is fully carrying out the construction program forecast last December when the Conference met.

Production of goods is manifestly adjusting itself to consumption.

Merchandising policies in retail distribution remain cautious.

The volume of new capital obtained by producing and distributing corporations in the first three months of 1930 totaled $1,584,000,000, a record for any first quarter in history with the exception of the first quarter of 1929, when the amount was only 2 per cent higher.

The report of the National Business Survey Conference has the following to say on metals:

"Increasing stocks of copper, even with curtailed production, occasioned a cut this month (April) of four cents a pound in the market price. This was followed by an expansion in foreign buying, but it is too early to gauge the effect on the domestic markets.

"Lead and zinc show increases in production and small increases in stocks. Prices remain low. Demand for lead from pigment manufacturers is improving."

The National Metal Trades Association report gives a summary of the replies to its questionnaire on business conditions in the metal lines as follows:

"A survey made in the middle of March, covering 600 plants, showed that 4 per cent reported business as excellent; 25 per cent as good; 48 per cent as fair; and 23 per cent as poor."

THE METAL INDUSTRY

With Which Are Incorporated

The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

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Editorial

American Foundrymen's Convention

The Annual Foundry Week of the American Foundrymen's Association will be held May 12-16, in Cleveland, Ohio. The program will include a wide range of subjects for non-ferrous foundrymen, from melting practice to cost finding. There will also be a shop operation course and round table discussions.

C. E. Hoyt, executive secretary of the American Foundrymen's Association has a very important message for foundry executives, in the American Foundrymen's Association bulletin for April, pointing out that it is to their financial advantage to send their men to the convention to pick up ideas for better methods, better equipment and better castings. The purpose of these conventions is simple—the advancement of the industry. To this end, experts from all over the United States and abroad attend, giving their information freely and listening attentively to learn what they can. There is no better, quicker or cheaper way of keeping abreast of developments than attending these highly concentrated periods of mutual education and interchange of facts.

Let the foundry foremen and superintendents go to the convention and bring back full notes on what they saw and heard. A report to the manager will show clearly how worth while it was for them to attend. The meetings will be strictly business. The exhibitors will be intent on work alone. There will be no useless distractions, such as the unnecessarily lavish room entertainment which used to be offered. The few lighter features, such as banquets and other forms of entertainment will give the visitors a chance to discuss informally the problems which were brought up at the meetings and exhibits. These entertainment features are valuable for the reason that they afford members a chance to talk shop freely and without restraint.

Let the foundry executives aid in making the attendance at this convention the largest in the history of the Association.

Ford's Industrial School

According to reports in the daily press, Henry Ford is running a school in Sudbury, Mass., with the same originality that he has used in running his automobile plant. As he sees it, the school is to teach the boy the essentials of self-preservation; what to do; how to take care of himself, his clothes and his house; how to earn money and spend it intelligently and independently. In other words, his institution will prepare boys for the practical business of life.

The boy's day begins at 6 A. M. and runs on steadily until bedtime, 9 or 10 P. M. His work includes electrical and automobile engineering, plumbing, carpentry, construction and all of the trades which are necessary in the upkeep of houses, barns, workshops and mills. The boy receives a weekly wage and pays back part of it for board. He is given certain hours for study and a certain length of time in which he must cover a specified amount of work. It may be one or three weeks. All that is required of him is the result at the end, the disposition of the specific hours being left to his own discretion. The old time lectures and recitations are replaced by class discussions and debates.

There are no foreign languages, very little literature, no required art or music; in other words none of the "cultural" subjects. History consists of a history of industry; civics is included. The program consists largely of the exact sciences, with mathematics, physics and chemistry predominating. No natural sciences are included, no biology, botany or zoology.

The artistic impulses are allowed expression through the medium of home made furniture, musical instruments, radios, etc. Music lessons are given to those who wish them.

Sports have no large place in the program, probably due to the fact that the boys are tired at the end of a day, two-thirds of which is devoted to physical work. Nevertheless, the more useful sports, like swimming and skating, are popular. Entertainments are provided, such as square dances with local young people.

The diet is severe. Sugar and spices are prohibited; no cake, pie, candy, puddings or sweet desserts are served. Coffee, tea and cocoa have been eliminated; even salt is used sparingly. Needless to say smoking is taboo.

Obviously enough, the experiment is interesting and only time can tell how successful it will be. The lives of the boys will be strictly regimented. Their physical condition should be excellent, but it remains to be seen what will happen to their initiative and enterprise after such a severely regulated life.

Copper Price Breaks

On April 15, 1930, the price of electrolytic copper which had been held for about a year at 18c per pound, was reduced to 14c. The poor demand and the continuous, unbroken rise in the unsold stocks of copper were the cause of this slash. The cut was followed shortly afterward by the sale of several million pounds abroad, but American consumers are still holding back. The new price, 14c, is the lowest in over two years.

According to rumors, the reduction was precipitated by the insistence of the smaller producers who could no longer carry their unsold metal and who had been denied precedence in participating in the export demand. The producers as a whole have not yet tied up all of the fabricators and are consequently not in a position to control, absolutely, the American consumption of copper and copper alloy products. Foreign producers and smaller American mines continued to run at capacity while the large American producers curtailed operations, taking all the load upon themselves. Of course, the fabricators immediately revised their price lists to conform to the change in copper quotations.

The daily press is pointing the finger of scorn at the copper producers, repeating again and again the old saws that economic laws must sooner or later take effect and that artificial price regulation is impossible.

Without attempting to go into generalities such as "basic economic laws," the "fundamentals of supply and demand," etc., we venture one opinion—that throughout the whole year 1930 the copper producers would have sold just as much copper at 18c as they will at 14c. As regards the impossibility of controlling prices legitimately, we can only think of the situation in nickel and aluminum. Perhaps the position of copper is not analogous to that of these metals, but perhaps also the pressure of circumstances may in time make it so.

Tariff on Silver

The difficulties of the silver market have prompted the Senate to propose a duty on silver of 30c an ounce. This has called forth from the Jewelers Vigilance Committee, a protest based on the following reasons.

1. Silver is a commodity only to a limited extent being still used as a medium of exchange by over half the people of the world.
2. The United States, producing twice as much silver as it consumes, exports millions.
3. If the domestic manufacturer has to pay a premium of 30c an ounce more than his foreign competitor, the foreign manufacturer will be able to ship his manufactured product to this country and undersell.
4. The silver market is suffering from over-production. It is to the interest of the industry to provide new avenues of consumption and distribution. A tariff would tend to increase production and decrease consumption.

The fate of the silver tariff is now in the hands of the conferring committees of the House of Representatives and the Senate, and the result is consequently unpredictable at this time. To us, it seems clear, however, that from the standpoint of the manufacturing silversmith, the above objections are sound. Essentially what silver needs is increased markets and wider consumption, through lower price or an increased number of uses. Artifically raising its price to stimulate the industry, which is already over-producing, (and to a great extent in the form of a by-product) seems clearly uneconomic and unsound. What the silver industry needs is a program of research followed by assiduous cultivation of the new markets found. This will call for trained and intelligent workers, sufficient funds and time to work out this program soundly. It is only by such progressive and business-like methods that an industry can be revived.

New England Stability

The New England States are staging a revival. This community, which has suffered in past years from the competition of districts better favored geographically, is making a determined and successful effort to keep its place in the sun as one of the leading manufacturing centers of the United States.

The importance of this part of the country to the metal industries is clearly shown by the Census reports. In 1925 (the latest completed Census of Manufactures), the brass, bronze and copper industries in New England created almost $60,000,000 in new wealth. In other words, this figure represents value added over and above the cost of raw materials. It is noteworthy that although this represented only 2 per cent of New England's net factory income, it was 32.5 per cent of the net income of the whole United States from this industry. Cutlery and edged tools were responsible for $33,000,000 of added value, 1.1 per cent of New England net factory income, and 55.4 per cent of the net income of the United States from this industry.

New England's share of other metal working industries is proportionately large. In jewelry it produced 35 per cent of America's net income; in plated ware, 54 per cent; typewriters and supplies, 32 per cent; ammunition, 53 per cent; grinding and polishing devices, 65 per cent; hardware, 43 per cent; firearms, 75 per cent; clocks and watches, 32 per cent; silverware, 33 per cent.

Like any other well populated district, New England may have its fluctuations in prosperity. It is clear, however, that its industries are much too important and powerful to be dismantled and scattered, in spite of the fears which were voiced when the large copper producers began to buy up the brass mills.

Stainless Iron Versus Electroplate

A new controversy is raging among manufacturers of metal products which take high polishes or special finishes. Will the new stainless iron, 18 chromium, 8 nickel, balance low carbon steel, replace nickel and chromium platings?

Let us review some of the experiences of the users of the 18-8 mixture. One of the large automobile manufacturers, we are told, has had continual trouble with metal which splits in the stamping and forming operations, consequently finding it necessary to sell the split metal to other manufacturers for them to use on smaller articles. The price obtainable for this scrap is low, a maximum of 8 cents per pound, down to the price of cold rolled steel scrap. The price of new 18-8 sheets is a minimum of 28 cents per pound.

Further information points out that it costs this plant $2.47 more per radiator shell to make them out of the 18-8 mixture than it would to turn out a plated shell. In one case it is said that the cost of 18-8 metal was $6,000,000 a year more than the cost of making the shell of sheet iron and coating it with 0.002" of nickel and then chromium. The 18-8 metal is an expensive luxury.

Some of the reasons for this greatly increased cost are obvious. Using a sheet iron shell with 0.002" thickness of copper and nickel plate together, followed by a 5-minute plate of chromium, results in a finished product which contains only 5% by weight of non-ferrous metals, the expensive elements. The 18-8 mixture contains 26%, said 26% being very expensive metals. This undoubtedly accounts for the decision of another of the largest automobile manufacturers not to take it up at this time.

There is no doubt that the 18-8 mixture has its place. It is valuable for engine parts such as knuckles and shafts. There is room here also for the chromium-nickel-silicon steels because of their high strength. But it seems from present indications that plating as an industry will not suffer from the attack of stainless iron. On the contrary this competition will probably result in a better quality of plated work. The advent of chromium plating brought their plating departments directly to the attention of manufacturers who had never before considered them anything but a necessary evil. The "competition" of stainless irons should result in putting electroplating where it belongs, the development of standard plates, weights and thicknesses, the improvement of quality and the stabilization of the industry.

Prize for Foundry Article

In our January issue we announced the institution of two prize awards of $50 each for the best original paper published in THE METAL INDUSTRY during 1930 on metal manufacturing and on metal coating. At this time the foundry is very much in the public eye, due to the coming convention of the American Foundrymen's Association. For that reason we again bring to the attention of our readers, our prize offered for the best paper on metal manufacturing which includes the work in the brass, bronze, aluminum and white metal foundry.

The committee of judges for this prize has been chosen, consisting of the following: Chairman, **G. H. Clamer,** president, Ajax Metal Company, Philadelphia, Pa.; other members, **W. J. Reardon,** president, National Alloys Company, Detroit, Mich. and associate editor of THE METAL INDUSTRY; **H. M. St. John,** chief metallurgist, Detroit Lubricator Company, Detroit, Mich. and associte editor of THE METAL INDUSTRY. We commend this contest to our readers and contributors, all of whom are eligible except those on the staff, or associate editors of THE METAL INDUSTRY.

Correspondence and Discussion

Copper Plating Camshafts

To the Editor of THE METAL INDUSTRY:

One important use of cyanide copper plating solutions is for the plating of camshafts in automobile motor industry. The thickness of copper required to prevent a carburized case depends on the temperature and period of heat treatment.

A careful survey by the writer has proven that a deposit of copper having micrometer thickness of .001 to .0015 will stand a heat of 1,750 degrees Fahrenheit for a period of twenty-four hours or more.

Since copper plating was adopted the case of hardening of camshafts, the burden of straightening after heat treatment, and the time, labor and breakage was reduced to a minimum.

WILLIAM STOKES.

Detroit, Mich., March, 1930.

Appreciates Advice on Casting

To the Editor of THE METAL INDUSTRY:

I wish to thank you for your kindness and advice on how to cast aluminum. I appreciate the trouble you have gone to in order to give sound advice on this matter. Your sketch will be of great benefit to me and I sincerely thank you.

Somerville, Mass., March, 1930. T. W. BLOOMER.

"Would Not Be Without It"

To the Editor of THE METAL INDUSTRY:

It is with great pleasure that I enclose check for three years' further subscription to your most useful book. It helps all platers with its up-to-date advice and instruction. I would not be without it.

Detroit, Mich., April, 1930. R. E. KITE.

New Books

Industrial Advertising Copy. By R. Bigelow Lockwood. Published by McGraw-Hill Book Company, Inc., New York. Size, 5½ x 8; 328 pages; price, $3.00.

A textbook which covers in a complete and very practical manner a field of advertising which is constantly growing in importance and to which too little attention has been given in the past. This work, by one of the advertising counselors of the McGraw-Hill Company, publishers of a long string of important technical journals, is the answer to the questions which must arise in the minds of all who seek to present intelligently any line of products or service to industry. It is for the executive as well as the advertising man. In effect, it answers two questions of paramount importance: What advertising treatment will get results in the technical field? and What factors of industrial marketing demand this specialized treatment and how are these factors met?

Principles and Practices of Up-Keep Painting. Published by the Prescription Paint Service, E. I. Du Pont de Nemours and Company, Public Ledger Building, Philadelphia, Pa. Sixth edition, revised and enlarged; 270 pages; price, $2.00.

This work by the Paint and Varnish Division of the Du Pont organization covers all phases of the subject, providing a permanent guide to a painting program. It is useful to plant executives, superintendents, engineers and owners. The price is said to be only a part of the full cost of the volume.

The Workmen's Compensation Problem in New York State. National Industrial Conference Board, Inc., 247 Park Avenue, New York. Size, 6 x 9; 375 pages; price, $3.50.

The main purpose of the study covered by this book was to compare the cost of workmen's compensation under the present New York law with that under the laws of New York's chief competitor states. Forty-two other state compensation laws were examined and compared and the cost in New York, all elements theoretically considered, was found far higher than in any other industrial state. Many other phases of compensation costs and problems are covered. Among these are:

Development and Provisions of the New York State Compensation Law; Comparison with Laws of Other States; Attitude of the Courts Toward Interpretation and Administration of the Law; Insurance; Experience in Operation of the Law; Cost of Workmen's Compensation in New York State.

Commerce Yearbook—1929. Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C. Volume I, United States. Bound in buckram; 670 pages; price, $1.00.

A bird's-eye view of American economic life in 1928. This is the official survey of developments in all branches of industry and trade in the United States and its possessions. The underlying basic features of business are discussed and comparative data for several years presented.

The Successful Control of Profits. By Walter Rautenstrauch. Published by B. C. Forbes Publishing Company, 120 Fifth Avenue, New York. Size, 5½ x 8; 239 pages; price, $3.00.

This book carefully develops the idea that business enterprises are capable of exact and revealing analysis—that an executive need not judge the activities under his control by rule of thumb, but may measure many of them with yardsticks that are no more vague than a surveyor's tape. Illustrated with 23 charts.

The author has been vice-president of the J. G. White Management Corporation, president of the Fred F. French Company, president of the Splitdorf Electrical Company, vice president and general manager of the Liberty Yeast Corporation, and is now Professor of Industrial Engineering at Columbia University, and consulting engineer to manufacturing industries.

GOVERNMENT PUBLICATIONS

Obtainable from Superintendent of Documents, Government Printing Office, Washington, D. C., at prices mentioned, unless otherwise noted.

Mineral Resources of the United States, 1928—Part I. Bureau of Mines, Department of Commerce. The following pamphlets, each devoted to the metal or mineral named, are obtainable at 5 cents each: **Mercury,** by Paul M. Tyler; **Secondary Metals,** by J. P. Dunlop; **Tin,** by C. W. Merrill; **Abrasive Materials,** by Oliver Bowles; and at 10 cents, **Zinc (General Report),** by E. W. Pehrson.

Specifications for Brass Wire and Barbed, Corral and Netting, Black or Zinc Coated Fence Wire. Federal Specifications Board, Washington, D. C. This is the second resubmission of proposed specifications. Obtainable free, from Board.

Plain and Thread Plug and Ring Gage Blanks. Bureau of Standards, Department of Commerce, Miscellaneous Publication No. 100. Covers recommended commercial standard as adopted by the American Gage Design Committee. Price, 15 cents.

Proposed Federal Specification for Tin Plate or Tinned Steel Sheet. Federal Specifications Board, Washington, D. C. Free, from Board.

Federal Specification for Black, Zinc Coated or Galvanized Sheet. Second resubmission. Federal Specifications Board, Washington, D. C. Free, from Board.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

Antique Bronze Finish

Q.—Please get me information on how to finish steel and brass stampings and castings in a Sargent No. 03 P finish. This is a sort of natural bronze brushed and oil rubbed to get the antique finish. It is new and is used on builders' hardware.

A.—This finish may be produced in the following immersion dip:

Hyposulphite of soda	4 oz.
Water	1 gal.
Sulphate copper	4 oz.
Water	1 gal.

Dissolve separately and mix; use solution warm and dip work in for a few seconds; dry out, scratch brush if necessary, and lacquer.

A darker brown may be produced as follows:

Sulphide barium	1 oz.
Water	1 gal.

Use cold and proceed as above. W. F., Problem 3,962.

Blistered Silver Plate

Q.—I am sending a sample of my silver solution, used for plating knives. It gives trouble. Very small blisters appear on the blades, which are of new carbon steel, which should be perfect for plating. The preparation is as follows:

Knives are brushed in cleaner; scratchbrushed with pumice; rinsed in water; pickled in muriatic dip; cleaned again; struck in hot copper; struck in silver; then placed in regular silver solution for one hour.

What do you suggest to remedy this trouble?

I am using a 69-gallon earthenware tank for the silver solution. This tank seems to be porous, allowing solution to leak through. What can I line the tank with to prevent this?

A.—Analysis of silver solution:

Metallic silver	1.50 oz.
Free cyanide	4.00 oz.

Add 2 ounces of silver cyanide and 1 ounce of sodium cyanide to each gallon of solution.

Your method of plating steel knives is different from the usual practice. The knives after cleaning should not be copper plated but struck in a special silver strike made of sodium cyanide 8 ounces, silver cyanide ¼ ounce, copper cyanide ⅛ ounce, water 1 gallon. After passing work through this special strike, use the regular silver strike made of 6 ounces of sodium cyanide and ½ ounce of silver cyanide to 1 gallon of water.

To close the pores in the earthenware tank, line the tank with asphalt or one of the tank lining compounds that are on the market and which are advertised in THE METAL INDUSTRY.

—O. J. S., Problem 3,963.

Brass Mixtures for Spigots

Q.—Would you kindly state the proper mixture of metal, both in red and yellow, for spigots to be used for water pressure?

A.—The mixture generally used for this work is composed of 85 copper, 5 tin, 5 lead and 5 zinc. For red metal and yellow metal, use 70 copper, 27 zinc and 3 lead. However, as new metal costs more than scrap, in most cases, old valves and red brass scrap are used for red metal, 90 per cent scrap and 10 per cent copper added, being the usual proportion. For yellow brass, use scrap yellow brass free from aluminum, and add 2 per cent lead and ¼ per cent of 30 per cent manganese copper.

—W. J. R., Problem 3,964.

Brass Solution

Q.—We are sending to you a sample of our brass solution. Please analyze and advise us what is wrong with it. Will you advise us whether solution deteriorates by standing idle.

We are not using this constantly, and we find that each time we do plating, about once in two weeks, there is something wrong with the solution.

We have tried to doctor the solution each time, and have been able to get it to work for a while, but the next time we use it, we have the same trouble.

We would very much appreciate it if you would tell us what is wrong.

A.—Analysis of brass solution:

Metallic copper	5.86 oz.
Metallic zinc	.44 oz.
Free cyanide	2.20 oz.

A brass solution having the metals in this proportion would undoubtedly produce a deposit that would be quite high in copper or one resembling bronze.

The copper content is exceptionally high, so would advise you to discard one half of the solution, replenish with water, and then add zinc to the solution until proper shade of color is obtained.

Dissolve equal parts of zinc cyanide and sodium cyanide in water and add to solution. Use caution, and do not add too much. If you had given the volume of the solution, we could have told you approximately how much to add.

—O. J. S., Problem 3,965.

Chromium Plating

Q.—We are sending you a sample of our recently made chromium solution, contents of which are 48 oz. chromic acid and 3 oz. sulphuric acid. We find that in plating our line of brass fittings, the parts that are most exposed become plated, whereas the corners and curves do not, or are very hard to plate, as the sample of work we are sending will show.

In our plating room we use a 6 volt, 750 ampere generator and have a 4 x 2 x 2½ foot tank.

We would appreciate any information or advice you can give us on this subject.

A.—Analysis of chromium solution:

Chromic acid	62.16 oz.
Trivalent chromium	0.41 oz.
Sulphates	0.31 oz.

Analysis shows that there is nothing radically wrong with this solution. The trivalent content is a little high and should be reduced by the porous pot method.

If proper temperature and current density are used, good results will be had. Proper methods of racking the work will overcome the tendency of the more exposed parts to receive the highest current density and becoming dull.

—O. J. S., Problem 3,966.

Defective Nickel Solutions

Q.—We are sending you samples of two nickel solutions and several samples of the defective work produced in these solutions. Will you please analyze the solutions and advise as to their condition, means of improving them, etc.?

A.—Analysis of nickel solutions:

No. 1	Metallic nickel	4.22 oz.
	Chlorides	4.33 oz.
	pH	6.8
No. 2	Metallic nickel	3.36 oz.
	Chlorides	1.28 oz.
	pH	5.4

The pH of No. 1 solution is too high. We suggest that you add to each 100 gallons of solution 12 fluid ounces of C. P. sulphuric acid.

The chloride content and the pH of No. 2 solution are too low. We suggest that you add 1 ounce of sodium chloride to each gallon of solution; and to each 100 gallons and 8 ounces of 26° ammonia. The high pH of No. 1 solution is the cause of the dark deposit you are obtaining.

—O. J. S., Problem 3,967.

Foundry Practice

Q.—We are having difficulty in making sound brass castings. While we are using an oil-fired graphite crucible furnace and attempt to cover our charge at all times with charcoal, we still seem to get included oxide on the cope side of the castings. We have attempted a number of different fluxing reagents without any apparent results. I might add that our charge consists mainly of body valves.

Could you give us any suggestions as to correcting our practice to eliminate spots that show up in machining the castings?

In about two months the students here are planning on a shop reception, at which time they are desirous of giving out some small paper weights as souvenirs. I have suggested a mixture of lead and antimony cast in some type of a cast iron mold. If you have had any experience in this direction or can offer any suggestions they will be greatly appreciated.

A.—We suggest that you add to your scrap brass valves 1 per cent nickel-copper alloy composed of 50 per cent nickel and 50 per cent copper, and pour in water to shot it. Also add ¼ per cent of 30 per cent manganese copper. This will help eliminate the oxide and gases taken up in melting.

In reference to alloy for small paper weights, such souvenirs could be cast in a die mold. Any of the following mixtures would answer:

A bright metal can be made of 92 tin, 6 antimony and 2 copper; another could be 92 lead, 6 antimony and 2 copper.

—W. J. R., Problem 3,968.

Immersion Coppering

Q.—I would appreciate if you would let me have your expert opinion as to the practice of copper coating cold rolled strip steel by immersing the steel into a solution of copper sulphate. Kindly answer the following:

Should pure or commercial copper sulphate crystals be used?

What quantity of copper sulphate crystals should be added to a gallon of water?

What should be the temperature of the copper sulphate solution and time necessary to secure a satisfactory coating?

How should we prepare our strip steel before it enters the copper sulphate solution?

How should we treat our strip steel after it leaves the copper sulphate tank?

We would like to obtain an adhesive coating of copper, as bright as possible. We realize that the dip process is not of great value, but we have been asked to furnish strip steel in coils coated with copper by immersion in a bath of copper sulphate.

A.—In coppering by immersion, the following solutions will give good results:

Copper sulphate (commercial)	2 oz.
Sulphuric acid	1 oz.
Water	1 gal.

Use at room temperature.

The work should be perfectly clean before immersion and the process requires approximately one minute for a color. If the work is left in solution too long, the deposit has a dark color and is easily removed.

The work should be dried by passing through a clean cold water dip or spray, then through clean hot water, and the excess of water removed by passing the work through a current of hot air.

Special equipment will be necessary to produce the work in coils and any platers' supply house can supply you with this equipment. See the advertising pages of this journal for the names of supply firms.

—O. J. S., Problem 3,969.

Old Iron Finish

Q.—Will you please give me the formula for old iron finish on hardware.

A.—To produce an old iron finish make up the following solution:

Double nickel salts	8 oz.
Copper sulphate	3 oz.
Sodium chloride	16 oz.
Water	1 gal.

Use at room temperature; 1 to 2 volts; 3 to 5 amperes per square foot; nickel anodes.

Relieve the high lights to suit and lacquer with transparent lacquer.

You can also make a black nickel solution as follows:

Double nickel salts	12 oz.
Sulphate of zinc	2 oz.
Sulpho cyanate of soda	2 oz.
Water	1 gal.

Add to this solution ½ oz. ordinary cyanide copper solution to give a smutty deposit. Temperature, anodes, and current density are same as above.

This solution will give a velvet black which may be brushed down to any desired dullness. Relieve as needed and lacquer to preserve the finish.

—W. F., Problem 3,970.

Quartz Lamp for Chromium Defects

Q.—We would like to get some information concerning the new quartz lamp which we understand has been developed by the Packard Motor Car Company for the detection of defects in highly polished chromium plated articles.

We are at present using a sheet of tissue paper in front of an ordinary electric light bulb, but would like to change this method if we can find something which will improve the quality of our product.

A.—We have no specific information regarding the particular quartz lamp you mention. The purpose of the quartz lamp is to produce ultra violet light, because quartz transmits these rays while ordinary glass will not. We cannot see any advantage in using light containing ultra violet rays for this purpose as these rays cannot be seen.

Mercury vapor lamps using the ordinary lead glass tubes, or the blue daylight lamps would, we believe, be just as satisfactory for chromium inspection as the quartz lamp.

The quartz lamps now on the market are used for medical purposes only and are dangerous to use as they cause very severe cases of "sunburn."

—W. F., Problem 3,971.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,736,857. November 26, 1929. **Electrodepositing Apparatus.** William W. McCord, Wyandotte, Mich., assignor to McCord Radiator & Mfg. Co., Detroit, Mich., a Corporation of Maine.

In an electrodepositing apparatus, the combination with an endless cathode, of a trough containing an electrolyte for the cathode and following the contour thereof, said cathode being in band form and extending edgewise downward into the trough for the deposit of metal on the portion of the cathode in the trough.

1,738,748. December 10, 1929. **Corrosion-Resisting Coating.** Ralph J. Wirshing and Henry R. Faas, Detroit, Mich., assignors to the General Motors Research Corporation, Detroit, Mich.

An article of ferrous metal having thereon an inner coating containing tin and outer coating of chromium.

1,739,107. December 10, 1929. **Process of Making Chromic Acid.** Marvin J. Udy, Niagara Falls, N. Y.

Process of making chromic acid which comprises passing current between an insoluble anode and a cathode in contact with an electrolyte containing trivalent chromium between approximately 15% and 30% CrO_3, the composition of the electrolyte throughout the space between the electrodes being substantially uniform.

1,739,267. December 10, 1929. **Apparatus for Collecting Bronze Dust from Stamping Mills.** Friedrich Sporer, Nuremberg, Germany.

A dust collector for bronze stamping mills including a collecting box for the bronze-dust, a collector pot for the finest bronze dust freely arranged behind said collecting box, a hood-shaped filter adapted to cover air tight said collector pot and made of a material permeable to the air but impervious to the finest particles of bronze dust.

1,739,482. December 10, 1929. **Method of and Apparatus for Coating Metal Articles.** Darwin G. Griswold, Wallingford, Conn., assignor to R. Wallace & Sons Mfg. Co., Wallingford, Conn.

The method of coating an article with tin, which comprises first applying a rough coating of tin to the article, permitting said coating to solidify, then immersing the article in a bath of molten tin to melt the rough coating, then removing the same from said bath, and then rotating the article at a high velocity about an axis within itself to throw off by centrifugal action the surplus coating of metal, returning said material to said bath.

1,739,657. December 17, 1929. **Electroplating Device.** Reuben B. Shemitz, New York, N. Y.

A device for electroplating a surface comprising an insulating, acid resisting casing having openings in the opposite walls thereof, a filling neck in the casing, a cap for said neck, an electrode of plating material positioned in the casing, threaded members engaging said opening for supporting said electrode and one of said members constituting a contact post extending exteriorly of said casing.

1,739,717. December 17, 1929. **Method of Treating Shavings and Scrap of Light Metal and Alloys Thereof.** John A. Gann, Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich.

In a method of treating light metal, the steps which consist in adding the same to a bath of suitable flux and like metal, heating the mixture to a condition of partial fusion of the metal, agitating the mass until the metal coalesces, and subsequently raising the temperature to render the metal sufficiently fluid to permit substantially complete separation of the flux and sludge from the metal.

1,739,992. December 17, 1929. **Process of Working Up Mixed Shavings of White Metal and Red Metal.** Anton Schwarz, Berlin-Weidmannslust, Germany.

A process for working up mixed shavings of white metal and red metal, comprising heating the mixture to a temperature above the melting point of the white metal shavings but below the melting point of the red metal shavings, cooling the mixture slowly, subjecting the mixture during the cooling to a selective disintegration in which the brittle white metal particles are brought to a finer grain than the red metal particles, and separating the white metal particles from the red metal particles by mechanical methods.

1,740,114. December 17, 1929. **Wiper for Metal-Coating Machines.** William A. Painter, Detroit, Mich., assignor to McCord Radiator & Mfg. Co., Detroit, Mich., a Corporation of Maine.

In a wiper assembly for metal coating machines, the combination with a block forming a support and having a longitudinal groove therein, of a glass tube forming a nonrotative wiper element and fitting in said groove, a rod extending through the glass tube, an asbestos packing between the rod and the tube, and means carried by the block and engaging the opposite ends of the rod beyond the tube for removably clamping the tube in the groove.

1,740,752. December 24, 1929. **Treating Lead Alloys.** Gustave W. Thompson, Brooklyn, N. Y., assignor to National Lead Company, New York.

The process of purifying lead alloys which consists in maintaining an interface of extended area between a molten mass of such alloy and an overlying mass of caustic alkali containing an oxidizing agent, and coincidently agitating said masses to change the material constituting the contacting faces thereof.

1,741,166. December 31, 1929. **Metal Polishing Machine.** Otto G. Schmitt, Chicago, Ill., assignor to The Scholl Mfg. Co., Inc., Chicago, Ill.

A metal polishing machine comprising a stationary frame work, a supporting table vertically movable thereon, means for adjusting the supporting table, a reciprocating table mounted on said supporting table, feed mechanisms on said reciprocating table for advancing a strip of material to be polished over said reciprocating table.

1,741,388. December 31, 1929. **Metal Coating Metal Sheets.** Earl R. Wehr and Carl C. Mahlie, Middletown, Ohio, assignors to The American Rolling Mill Company, Middletown, Ohio.

A process of coating metal sheets which consists of passing them through a flux into a molten body of zinc floating on a molten metallic bath of a heavier metal, down through said molten metallic bath of a heavier metal, and up through a molten metallic body containing zinc and alloying material and floating on the molten bath of a heavier metal, said heavier metal being such as will not substantially absorb said zinc alloy.

1,741,405. December 31, 1929. **Adjusting Means for Rolling-Mill Rolls.** James R. Coe, Waterbury, Conn., assignor to The American Brass Company, Waterbury, Conn.

In a rolling mill including a housing member and a roll supporting member, a pair of wedges between the said members, one of said wedges being substantially rectangular in cross section, cooperating means between said wedge and one of the members to retain the wedge in position.

1,741,733. December 31, 1929. **Alloy.** John V. O. Palm, Cleveland Heights, Ohio, assignor to The Cleveland Graphite Bronze Company, Cleveland, Ohio.

A bearing alloy consisting of 70 to 75 per cent of lead, approximately 5 per cent copper, 12 per cent tin, 4 per cent mercury and 4 to 8 per cent of antimony.

1,742,214. January 7, 1930. **Metal Coating Apparatus and Method.** Charles W. Owston, Detroit, Mich., assignor to McCord Radiator & Mfg. Co., Detroit, Mich.

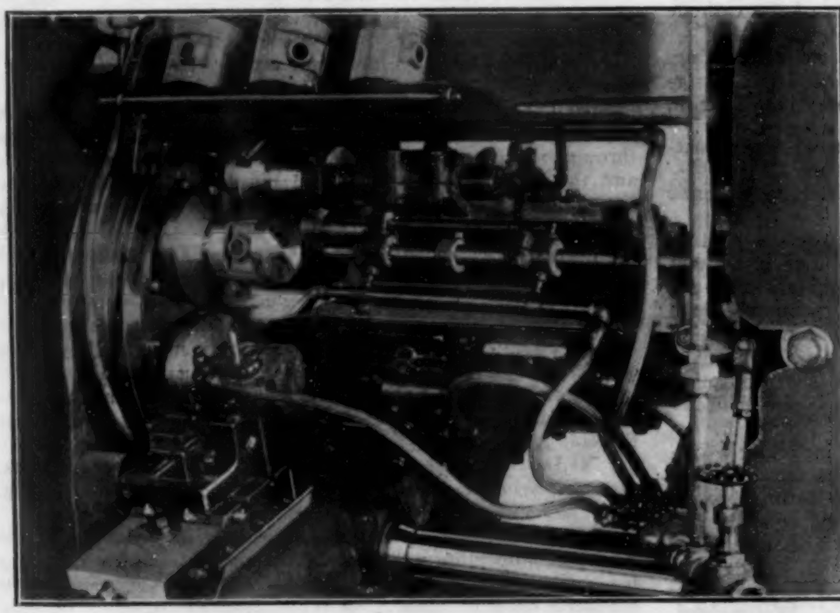
In an apparatus for coating one side only of sheet metal band or ribbon stock with metal by a continuous process, the combination with means including a roller for cleaning the under side of the band, of a plurality of coating rollers for coating the under side of the band with molten coating metal without running the band through the coating metal.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Automatic Chucking Machine

An automatic chucking machine has been designed and placed on the market by The Baird Machine Company, Bridgeport, Conn., which has recently been applied to the machining of automobile pistons, as shown in the accompanying illustration. In this application, the piston casting is held in the spindle by a holding fixture using a pin passing through the wrist pin holes in the piston and a corresponding hole in the end of a member of the fixture.



Automatic Chucking Machine in Operation on Aluminum Pistons

The operator places his foot on the lever near the floor. This action withdraws the work locator. He removes the pin, then the piston and locates another casting against a circular part of the face of the spindle. Then he slips the pin in place, removes his foot from the foot lever and the work locator holds the piston until it is firmly grasped by the automatic holding fixture.

Connected with the work locator is the safety control by means of which the turret is prevented from indexing while the foot lever is held down. Because of this the operator is safeguarded while loading and unloading. In addition to preventing possible injury to the operator, this safety control practically eliminates damage to tools and work.

The piston is successively carried to the five working stations where the skirt, the grooves and the end are both rough and finished turned in the one handling. The end is turned in such a way that the tool is removed from the surface, so that no tool marks mar the end of the piston. The skirt of the piston is turned with a slight taper.

The floor to floor time on pistons is from 15 seconds up per piece, depending on nature of material to be turned, size of piston and amount of stock to be removed, kind of tools used, and the speeds and feeds that they will stand.

The checking machine can also be provided with an automatic machine stop which automatically stops the machine after a cycle of operations and prevents the work from passing through the machine a second time in case the operator has not attended to the unloading and reloading. The act of reloading automatically releases the automatic stop without further action on the part of the operator. Complete information on this equipment may be had by addressing the manufacturer.

Graphite Paint

Joseph Dixon Crucible Company, Jersey City, N. J., manufacturers of a great variety of graphite products, has on the market an industrial silica-graphite base paint for which it claims a number of unusual qualities.

The new type of paint has for a base flake silica-graphite, giving it high water-repellent properties and making it chemically inert. This paint is supplied in fourteen colors. The company states that the paint is especially good for protecting metals, iron, steel, etc., against corrosion. The company makes maintenance floor paint for protecting wood, composition, concrete, etc., in eight standard colors. A bright aluminum paint containing a durable spar varnish is also produced. This is said to be very weather-proof as well as brilliant. It is mixed, ready for use. The paints are marketed through the company's Paint Sales Division.

Acid-Proof Cement

The selection of a bonding material for use in construction and maintenance of masonry used for handling hot or cold acid gases is a matter which requires careful attention. The Quigley Furnace Specialties Company, 56 West 45th Street, New York City, have issued a booklet describing a cement which they have developed for this work. It provides a ready mixed acid resisting cement which was produced after considerable research. The booklet is illustrated profusely and describes a great variety of uses to which the cement has been put. It also gives directions for application, testing of joints, patching and repairing, and other interesting details.

The Quigley company offers copies of Booklet C121 describing this cement to interested parties applying to them for it.

Polishing Paste for Stainless Steel

For polishing and grease wheel operations on stainless steels and rustless irons, the E. Reed Burns Manufacturing Corporation, with plants at Chicago, Ill.; Cleveland, Ohio; and Brooklyn, N. Y.; has brought out a new product, "Aluminite Paste." Believing that the abrasive employed on such metals should be free from any great amount of ferric oxides the new paste has been made with an abrasive which contains no iron, the Burns company states.

The compound is of the hard paste type,—of different grades of abrasive,—combined with the correct amount of lubricant to meet polishing wheel speed. The makers believe that it will supersede the old time emery paste in the polishing of the new steels which contain chrome and nickel.

Preparing Die Castings for Electroplating, Lacquering and Finishing

By D. J. BENOLIEL,

International Chemical Company, Philadelphia, Pa.

With rapid increase during recent years in the use and applications of die castings, the methods of handling the die castings have not always kept pace with the increased use. More and more intricate castings and different alloy formulae have, of course, complicated the entire manufacturing procedure.

To get a proper electroplate or lacquer coat on many kinds of die castings it is often necessary to slightly etch the surface. The usual run of cleaners and alkalis must be handled with a great deal of caution because if the time of immersion in the bath is not watched carefully a bad etching or tarnishing is liable to result. For this reason many plating authorities recommend that a die casting be cleaned in a solvent of some kind and then be given a rapid dip in an electric cleaner which will guarantee a chemically clean surface, but at the same time will not be lengthy enough to injure the die castings.

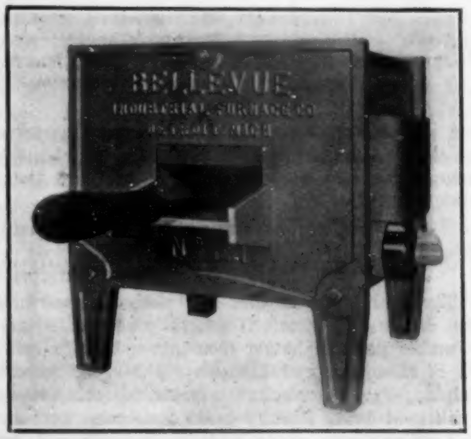
Such methods of cleaning are, of course, not consistent with rapid, economical and safe production. Therefore, the International Chemical Company has been working for the past five years and has developed new types of chemical mixtures that will give "toolproof" results on the cleaning of die castings.

These new compounds are quite different from the regular run of metal cleaners. Some of the compounds are composed of alkalis, alkali salts, colloids and certain special chemicals which act as buffers and prevent the alkaline products from etching the metal surfaces. As a result, it is possible to make up a solution of a special International die casting compound and to immerse almost any type of die casting in it for a sufficient period of time to get a chemically clean surface without the use of solvents, brushing, or electric current. The compounds are so made up that the die casting can be allowed to remain in the solution for an hour at a time without the castings being injured or badly etched.

Some of these special compounds will remove greases and oil from die castings without the least bit of etching or tarnishing. Others give the slight etch necessary for a good electroplating or lacquer coat. All of them can be used either with or without the electric current.

Electric Soldering Iron Heater

A new type of heating apparatus for soldering irons has been designed and placed on the market by the Bellvue Industrial Furnace Company, 2971 Bellvue Avenue, Detroit, Mich. The company has applied for patents on the device, known as the No. E-1 electric heater for soldering irons. The manufacturer states it is rapid, simple, portable, and creates no gas, noise or stray heat. It operates on 110 volts, 15 amperes, 1,600 watts, can be attached to any 110 volt outlet by means of flexible heater cord furnished with heater and controlled by indicating snap switch and equipped with "Globar" cartridge type heating elements which are replaceable while furnace is at full heat, requiring no dismantling and slight expense. No blowers or other auxiliary equipment is needed. Small work can be annealed or hardened in the heater. The makers state further that due to its sturdy design the heater can also be used for laboratory purposes.



Portable Electric Soldering Iron Heater

Brushing and Buffing Lacquers

A line of brushing and buffing lacquers is manufactured by the Agate Lacquer Manufacturing Company, 11 to 13 Forty-third Road, Long Island City, N. Y. This company was formed in January, 1927, by Alexander N. Braun and William Chace, both practical men who understand the needs of manufacturers using lacquers for finishing purposes. The company's business, they state, rapidly expanded and within a year of its establishment the firm constructed a new building. The increasing demand for their products they attribute to the fact that they endeavor to see that all the requirements of the purchaser are fully met and that the lacquers which they sell make profits for those who use them.

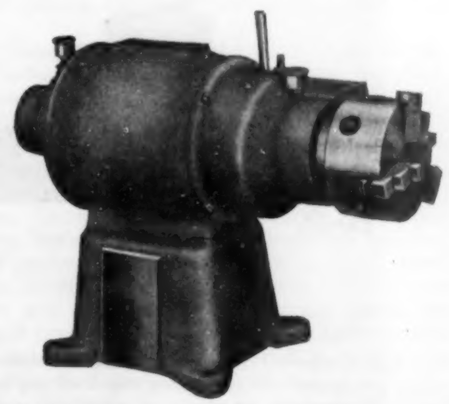
Polishing and Finishing Small Parts

A lathe especially designed for polishing and finishing of small parts has been placed on the market by The Schauer Machine Company, 905 Broadway, Cincinnati, Ohio. The equipment, known as the "Ideal" speed lathe, is described by the manufacturers as follows:

The entire design of the "Ideal" speed lathe is one of extreme simplicity; consequently, there is no maintenance expense and practically no attention is required other than occasional oiling. The construction of the lathe embodies a two-speed, totally inclosed, dust-proof motor; automatic brake, ball bearing, extension in motor spindle to take extra long rod stock, and 4-inch chuck.

High or low speeds are selected by means of a speed control switch in the motor base. Either speed, as desired, is determined by the position of the switch. The brake stops the motor in three seconds when running at high speed, and one and one-half seconds at low speed. This brake is of special design and operates against a large diameter extended surface of the motor spindle. The brake shoe is lined with a high grade brake material. Means are provided for regulating the brake pressure and adjusting for wear of the brake shoe.

The motor is $\frac{1}{2}$ h.p., of two-speed design to provide 2,700 r.p.m. and 1,350 r.p.m. on direct; 3,400 r.p.m. and 1,700 r.p.m. on alternating current.



Speed Lathe for Small Parts

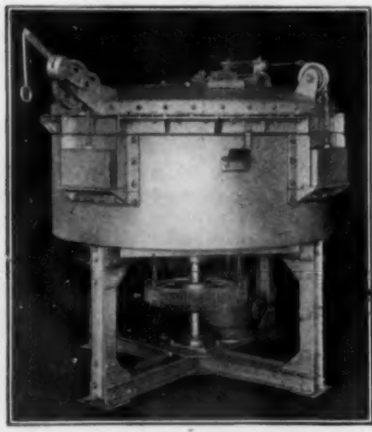
A hollow spindle within the motor permits insertion of 1 inch rod or tube stock 9 inches long from the face of the chuck, making it possible to finish or polish 12 to 16 inch rods without an end support. The lathe is regularly equipped with a 3-jaw universal chuck to take 1 inch rod or tube stock, and chuck up to 4 inches.

The lathe can be had for bench mounting, as illustrated, or with a pedestal for floor mounting.

New Electric Rotary Hearth Furnace

A new type of heat treating furnace for non-ferrous and ferrous metals has been designed and placed on the market by the W. S. Rockwell Company, 50 Church Street, New York City, manufacturers of industrial heating equipment.

The equipment known as the "Rockwell Electric Rotary Hearth



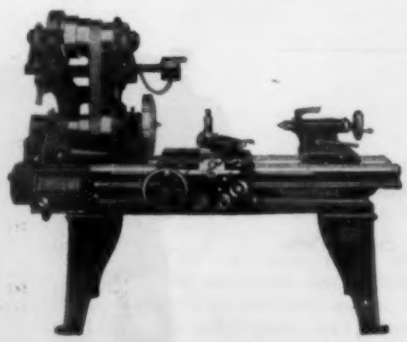
New Rotary Heat Treating Furnace for Metals

Furnace," is shown in the accompanying illustration. It was developed for continuous heat treating of metal products by employing a revolving alloy metal hearth. The manufacturers claim for it the qualities of simplicity, compactness, accessibility and a high percentage of properly heated work, with the important factor of low cost. Complete information is available upon application to the company.

Metric System Lathes

The South Bend Lathe Works, South Bend, Indiana, have just announced a complete line of metric system precision lathes suitable for cutting a wide range of international French metric standard threads, from .5 to 8 mm. pitch. These machines correspond in every way to the company's regular line of back geared screw cutting engine lathes, being of the same quality and made in 9 inch (235 mm.) to 18 inch (470 mm.) sizes, in a wide variety of styles.

The new lathes are equipped with metric thread precision lead screws, a metric gear box, and a metric thread spindle nose. Cross



Lathe with Metric Scales and French Standard Threads

feed and compound rest screws are furnished with micrometer collars graduated for regulating depth of cut by hundredths millimeter. Appearance of the new machines resembles that of the regular line, except for the gear box and headstock gear guard; incidentally, movement of the quick-change gear lever is the opposite of that on the English system lathes.

Like the corresponding English system lathes, the new machines are recommended by the manufacturer for making precision master taps, thread gauges, dies and fixtures, and for all machine work requiring accuracy in the tool room, manufacturing plant, engineering laboratory and repair shop.

Readers who are interested in screw-cutting engine lathes may obtain free copies of descriptive bulletins on request to the manufacturer.

Motor Air Cleaner for Grinders

Hammond Machinery Builders, Inc., Kalamazoo, Mich., manufacturers of various types of polishing, grinding and sawing machinery, provide all their polishing and grinding machines of 3 horsepower and larger size with a special air cleaner through which all air used to cool the motor must pass. The motors are totally enclosed but are cooled by a fan on the spindle. All the incoming air must pass through the centrifugal cleaner, as shown in the accompanying diagram. The cleaner is directly connected through the pedestal to the cored end bell. The fan, which is of special design, forces the clean, cool air over the motor windings and through the opposite end bell to the pedestal, where it is discharged. A uniform motor temperature of 40 deg. centigrade is stated to be insured. Operating at this temperature, the company claims, makes the machines more efficient than those hav-

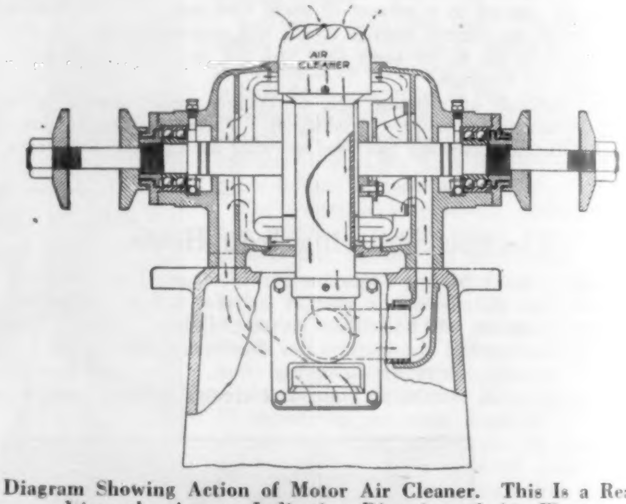


Diagram Showing Action of Motor Air Cleaner. This Is a Rear View, the Arrows Indicating Direction of Air Flow

ing unventilated closed motors or motors ventilated by open holes or slots. Emery, metallic dust and chips, etc., which cause trouble, cannot get into the motors equipped with the air cleaner, it is stated.

Metal Cutting and Drawing Paste

The lubrication of dies and plungers used in cutting, stamping and drawing of metals is generally recognized as a necessity, since it makes possible longer drawing operations and deeper stamping. E. F. Houghton and Company, 240 West Somerset Street, Philadelphia, Pa., manufacture a paste for this purpose which has the quality of being equally good for brass, copper, phosphor-bronze and other copper alloys, and also for iron and steel. It is claimed to be unexcelled for cartridge case drawing and similar work, while it is also correct for lathe and other cutting operations. The manufacturer states it will not curdle or give off bad odors, and that it is aseptic, having no strong alkalis to cause skin eruptions or inflammation on operators' hands. The paste is soluble in warm water and is diluted to proper consistency for various kinds of work.

The company has a pamphlet on this paste which gives full information as to the manner in which it is used for a variety of metal fabricating operations. This pamphlet can be had upon application to the company and is worth the perusal of anyone interested in drawing, stamping, cutting or grinding of metals, and also for those who copper plate wire that is previously bent, crimped or stamped.

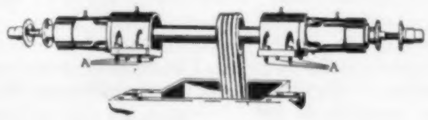
Reclaimed Buffing Wheels

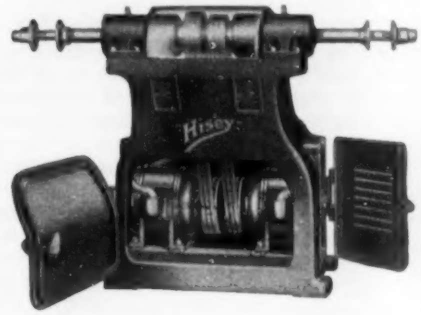
Robert E. Harrison, Emerald and Hagert Streets, Philadelphia, Pa., manufacturer of grinding, polishing and plating materials, is developing a business in reclaimed buffing wheels. This firm states that old buffs, of which it is one of the largest buyers, are cut down to smaller standard sizes, their only difference from new buffs, according to Mr. Harrison, being a slight discoloration. Pieced and sewed as well as glued muslin wheels are produced.

Buffing Equipment

The Hisey-Wolf Machine Company, Cincinnati, Ohio, manufacturers of portable electric machine tools, buffing machines, etc., issue the following report regarding the choice of buffing equipment by the Oxweld Acetylene Company, Newark, N. J.

Over a year ago, it is stated, that company decided to re-equip its buffing department and, following its usual custom, gave severe tests to a number of leading makes of equipment, keeping the results tabulated for careful study. After six weeks of testing, the company finally decided upon the Hisey "Tex-Drive" buffer, it is claimed, purchasing 21 of these machines. According to the report, the machine was better than its competitors by a wide margin in such points as maintenance cost, operating convenience, ruggedness, etc. The battery of machines have been in operation more than a year with practically no maintenance expense, it is claimed, while buffing costs have been reduced, output of the department increased and complete satisfaction of the management assured.





"Tex-Drive" Buffer. At Left Is Shown the Gooseneck Construction. Above, Diagram Showing Texrope Belt Drive. At Right the Accessibility of Parts Is Shown

For the "Tex-Drive" buffer the Hisey-Wolf company makes such claims as greater simplicity, rigidity and accessibility. Freedom from vibrations is stressed, as this makes for longer life of the machine. Complete details may be obtained by addressing the manufacturer.

Equipment and Supply Catalogs

H.P.M. Hydro-Power Presses. The Hydraulic Press Manufacturing Company, Mt. Gilead, Ohio. Illustrated 16-page catalog of hydraulic presses.

Alnor Portable and Stationary Temperature Measuring Instruments. Illinois Testing Laboratories, Inc., 141 West Austin Avenue, Chicago, Ill.

Metered Combustion Control for Boiler Furnaces. Leeds and Northrup Company, Philadelphia, Pa. Bulletin 660, on the Gibson system for power plants.

Motor Generators, Compressors, etc. Rockford Power Machinery Company, Rockford, Ill. Bulletin 37, a catalog of new and rebuilt equipment; 68 pages, illustrated.

Extruded Metal vs. Castings. A. C. Nielson Company, 4450 Ravenswood Avenue, Chicago, Ill. Survey No. 1446, on manufacture of hardware. Shows how costs were reduced.

Denham Costfinder for General Managers. Denham Costfinding Company, Inc., 3030 Euclid Avenue, Cleveland, Ohio. No. 35 of a series dealing with cost and profit calculation.

Safety Advertising. Policyholders Service Bureau, Metropolitan Life Insurance Company, New York. Pamphlet on methods of preparing and displaying safety advertising material.

Simplify Your Metal Parts Cleaning Operations. Colt's Patent Fire Arms Manufacturing Company, Autosan Division, Hartford, Conn. Leaflet on "Colt Autosan" metal cleaning machines.

Chromium Plating Temperature. E. Wambaugh Company, Hawks-Cortner Building, Goshen, Ind. A leaflet describing Foxboro equipment for solution temperature maintenance. An installation diagram is included.

Ajax Electric Furnaces. Ajax Electrothermic Corporation, Trenton, N. J. Bulletin No. 6, describing installations of Ajax-Northrup coreless or high frequency induction furnaces and motor-generator type equipment for metal melting.

Storage Battery Transportation. Edison Storage Battery Company, Orange, N. J. The March, 1930, issue of a monthly publication devoted to transportation problems. Contains an article on materials handling at the Roebling wire mill.

Four Slide Wire and Ribbon Metal Forming Machines. Baird Machine Company, Bridgeport, Conn. Bulletin 100; 36 pages, illustrated; covers a line of special machines for wire and ribbon metal forming, with data on application and operation.

Grinders and Polishers with Motor Air Cleaner. Hammon Machinery Builders, Inc., Kalamazoo, Mich. Bulletin No. 20, covering tool and production grinders, casting snaggers, combination disc and production grinders, double disc grinders, combination grinding and buffing machines, etc.

Haynes Stellite Products in the Oil Fields. Haynes Stellite Company, 30 East 42nd treet, New York. Describes "Haystellite," a tungsten-carbide diamond substitute; "Haynes Stellite," a hard-facing alloy of chromium, tungsten and cobalt; "Hascrome," a chromium-manganese-iron welding rod.

Jelenco Gold. J. F. Jelenco and Company, Inc., 136 West 52nd Street, New York. Bulletin No. 2: Interpretations of Physical Properties of Dental Golds in Terms of Structural Usefulness in Dental Gold Structures, by R. C. Brumfield. Also, a descriptive catalog of Jelenco Products, retail price list, etc.

General Electric Company, Schenectady, N. Y., publications: Arc Welding in Industry, an interesting, 40-page brochure, very well illustrated; leaflets on: Centrifugal Compressors, Geared Units; RKS Capacitor Motors; Automatic Welding Head and Control; Strip Heaters; Fabroil Gears; Enclosed Starting Rheostats for Repulsion-Induction Motors; Textolite Gears, Solid-Shaft, Vertical Induction Motors.

Die Stahl Kirche. Copper and Brass Research Association, 25 Broadway, New York. A handsome illustrated brochure on the design and construction of an entirely modern church in Germany. The building is of steel, largely, with a great quantity of copper and glass for decoration and protection. The illustrations and text are beautifully printed and the book is well worth the perusal of anyone interested in modern design, especially as it applies to the use of metals.

Treasure Trove. Frederic B. Stevens, Inc., Larned and Third Streets, Detroit, Mich. A hundred page book by Frederic B. Stevens, head of the company. This is No. 40 of the "T" Series by Mr. Stevens, and deals with his recent tour abroad. As usual, the book is full of interest, especially for those in the metal and finishing industries. The author's style is chatty but there is food for thought in a great deal of what he says. An interesting series of collection letters, used by the Stevens company at times to accelerate payment of bills by customers, appears in the book, as well as some humorous poetry. The book can be obtained by applying to the Stevens company.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

American Electrochemical Society

HEADQUARTERS, COLUMBIA UNIVERSITY, NEW YORK CITY

Meeting at St. Louis, May 29-31

The 57th Meeting of the American Electrochemical Society will be held at St. Louis, Missouri, on Thursday, Friday and Saturday, May 29, 30, and 31. Application has been made for reduced railroad fares to St. Louis. Details and certificates will be sent to all members.

The headquarters of the meeting will be the Coronado Hotel, situated in the geographical center of St. Louis, within two blocks of the theatre district, walking distance to Forest Park, on the crest of the city, and on the fashionable thoroughfare, Lindell Boulevard. Rates at the Coronado Hotel are $2.50 and up, including bath. All reservations for rooms should be sent promptly to the Coronado Hotel, St. Louis, Missouri.

Advance Program

The St. Louis program is as follows:

THURSDAY MORNING, MAY 29

Session on Electrodeposition, Dr. Charles L. Mantell, chairman of the Electrodeposition Division, presiding. Papers on Chromium, Cadmium, Nickel Alloys, Silver and other metals will be presented at this session.

THURSDAY AFTERNOON

Visit to the new Electrolytic Zinc Plant, Evans-Wallower Zinc Company, East St. Louis, Ill., and other plants in and about St. Louis.

THURSDAY EVENING

Informal Dinner and Dance, Hotel Coronado. (Special entertertainment for those who do not dance.)

FRIDAY MORNING, MAY 30

Symposium on Hydro-Electrometallurgy, T. H. Donahue, presiding. Copper, Zinc, Lead, Cadmium, Indium, Bismuth and Silver will be among the subjects discussed at this session.

FRIDAY AFTERNOON

Miscellaneous Scientific-Technical Session: Refractories, Rectifiers, Dry Cells, Batteries, Pigments, Corrosion, Phenol, Arc and Induction Furnaces, etc.

FRIDAY EVENING

Illustrated Lecture by Dr. George Moore, of Shaw's Garden, on the growth of flowers. Shaw's Garden contains the largest collection of plant life in America and is well known throughout the world for the botanical species and beautiful flowers.

SATURDAY, MAY 31

All-day excursion through the beautiful Ozark Mountains and visit to the lead mines.

Papers

The following are among the papers that have been accepted for presentation at the St. Louis Meeting:

"Methods for Determination of Absolute Potential" by Jean Billiter.

"Characteristics of Secondary Batteries under the Reduced Atmospheric Pressure and Their Applications to Battery Making" by S. Makio.

"Some Conductivity Characteristics of Chromic Acid and Chromic Acid Chromium Plating Solutions" by Robert H. Cherry.

"Couples in the Titration of Acids and Bases" by M. Leslie Holt and Louis Kahlenberg.

"Industrial Education for the Electroplating Industries" by Charles L. Mantell.

"The Ajax-Wyatt or Vertical Ring Induction Furnace as Applied to Melting Non-Ferrous Metals" by William Adam, Jr.

"Electrode Potentials of Silver in Cyanide Solutions" by Colin G. Fink and G. Byron Hogaboom, Jr.

"Electroplating of Copper-Nickel Alloys" by L. E. Stout, O. G. Burch, and A. S. Langsdorf.

"The Bent Cathode Test for Control of Cyanide Copper Baths" by Walter L. Pinner and Edwin M. Baker.

"The Production of Continuous and Seamless Tubing by Electrodeposition" by Jean Billiter.

"Status of Electrolysis as a Metallurgical Process" by T. H. Donahue.

"Some Recent Contributions to the Electrochemistry of Strong Electrolytes" by P. J. Van Rysselberge.

Ladies' Program

Members are urged to bring their wives and daughters as a very attractive Ladies' Program has been arranged for by the Local Committee: a Tea, Bridge Party, Dance, sightseeing trips, etc.

Richards Memorial Lecture Fund

The Society is continuing its drive for the Joseph W. Richards Memorial Lecture Fund, to be used in meeting "the expenses incurred by inviting and entertaining distinguished scientists from foreign countries." This fund has already received considerable donations, but the goal of $30,000 has not yet been reached. It is a memorial to Joseph W. Richards, first president and for many years secretary of the Society, who died in 1921.

American Electroplaters' Society

HEADQUARTERS, CARE OF GEORGE GEHLING, 5001 EDMUND STREET, PHILADELPHIA, PA.

Boston Branch

HEADQUARTERS, CARE OF ANDREW W. GARRETT, 45 KING STREET, DORCHESTER, MASS.

April Meeting

A regular meeting of the Boston Branch was held on Friday evening, April 4th. The attendance was the highest of the year, over sixty-five being present.

The meeting was called to order by President Gale. He first welcomed the Providence Branch representatives, of whom there were twenty present, having chartered a special bus for the occasion. This indicates fine inter-branch spirit and the Providence branch is to be congratulated on such a fine showing. He also welcomed a representative of the Worcester Branch.

The speaker of the evening, Dr. William Blum of the U. S. Bureau of Standards, Washington, D. C., was next introduced. The large turn-out and fine reception was, of course, a personal tribute to Dr. Blum, who has done so much for the plating industry that his name is a by-word among platers. His subject was "Chromium Plating." He outlined the latest developments in chromium plating; their uses; methods of plating; solutions; plating conditions; specifications for plate; research, past and present; and practically all important considerations affecting chromium. Dr. Blum answered questions after his address. There proved to be plenty of questions and the genial doctor was kept busy.

At the end of the question session, Dr. Blum was given a rising vote of thanks, and the meeting was adjourned at 10:45 P. M.

THOMAS JOHNSON, Secretary.

Hartford-Connecticut Valley Branch

HEADQUARTERS, CARE OF VERNON GRANT, 43 PUTNAM STREET, BRISTOL, CONN.

Annual Session and Banquet

The annual educational session and banquet of the Hartford-Connecticut Valley Branch of the American Electroplaters' Society will take place on May 10, 1930, at the Bond Hotel, Hartford, Conn. The session will begin at 2 p. m.

The banquet in the evening is expected to be a fine affair and all platers and their friends are urged to attend this function. Reservations should be made as early as possible by communicating with Frank J. Clark, 151 Sumner Avenue, Springfield, Mass., or with Vernon E. Grant, 43 Putnam Street, Bristol, Conn.

New York Branch

HEADQUARTERS, CARE OF J. E. STERLING, 2581 46TH STREET, ASTORIA, LONG ISLAND, N. Y.

On March 28 there was another meeting at which the principal business was the examination of new applications for membership, of which there have been quite a few of late. After the business was ended, the members had a good discussion of chromum and gold solutions, and a good deal of information was gleaned. This discussion lasted until a late hour, and the meeting was adjourned finally to permit members who live in the suburbs to catch their trains.

A regular meeting was held again on April 11. More new applications were considered. Four new members were elected.

At this meeting, we had with us our past president, Mr. MacStoker, who is now over his illness. Horace Smith, Supreme President of the American Electroplaters' Society, was a guest at the meeting. He told us of the resolution the Newark Branch will bring up at the coming convention, which concerns the inclusion of assistant foremen in the list of those eligible to membership in the Society. It is not certain whether the New York Branch members favor such a change, and there will be considerable discussion of it at the next meeting.

After the meeting there was some sociable conversation and everybody was feeling happy when the meeting adjourned at 11:30 p. m.

CHARLES HAUSHALTER, Recording Secretary.

Society of Automotive Engineers

HEADQUARTERS, 29 WEST 39TH STREET, NEW YORK CITY

Plans for the celebration of the twenty-fifth anniversary of the Society of Automotive Engineers to be held at French Lick Springs Hotel, French Lick, Indiana, May 25th to 29th, include a presentation of a number of historic motor cars and accessories, displays of early newspaper and magazine automotive advertising, and a showing of photographs and editorial accounts of outstanding automotive events which have occurred in the past twenty-five years. More than 1200 automotive engineers and executives will be present.

Materials Testing Society

HEADQUARTERS, 1315 SPRUCE STREET, PHILADELPHIA, PA.

Plans for 1930 Annual Meeting

The American Society for Testing Materials will hold its thirty-third annual meeting June 23 to 27, 1930, inclusive, at the Chalfonte-Haddon Hall, Atlantic City, N. J. An excellent program of papers is being arranged, including a complete symposium on aircraft materials.

In addition to the many technical papers there will be presented the usual number of committee reports including in addition to the reports of standing committees, reports of section committees and joint committees for which the society is sponsor or joint sponsor.

The first general session of the annual meeting will be held in the morning or afternoon of Tuesday, June 24, and the closing session will be held on Friday, June 27. Simultaneous sessions will again be held since this plan has proved very successful at the meetings in past years in providing for adequate discussion of the many items on the program.

The provisional program for the meeting will be given in the next issue.

The passenger associations have again granted reduced railroad rates for the annual meeting at Atlantic City on the Identification Certificate Plan. Indentification Certicates will be mailed to the members late in May. Tickets must be validated at the local ticket offices in Atlantic City and the holder must return by the same route used in going to the meeting.

Waste Material Dealers

HEADQUARTERS, TIMES BUILDING, NEW YORK CITY

As a result of discussions at the recent annual meeting of the National Association of Waste Material Dealers, the board of directors of this organization have appointed a committee to consider the formation of a Wholesale Metal Dealers' Division, as distinguished with the present Metal Division. David Feinberg, Boston, Mass., heads this committee, which will meet soon to discuss the proposal further. This committee wishes to hear from the trade in regard to the idea.

British Institute of Metals

HEADQUARTERS, 36 VICTORIA STREET, WESTMINSTER, LONDON, S.W.1, ENGLAND

The Influence of Technique on Research May Lecture of the Institute of Metals

The twentieth Annual May Lecture of the Institute of Metals will be given on Wednesday, May 7, by Major F. A. Freeth, on "The Influence of Technique on Research."

Southampton will be the scene of this year's meeting of the Institute of Metals, which is being held from September 9 to 12. At th emorning sessions a dozen papers of metallurgical and engineering interest will be presented for discussion. The afternoons will be devoted to visits to works in the neighborhood of Southampton, and also to a visit to Portsmouth Dockyard.

Personals

R. S. Dean

Several months ago R. S. Dean was appointed chief engineer of the metallurgical division of the United States Bureau of Mines.

Mr. Dean was born at Rolla, Mo., August 23, 1897. He was educated first in the public schools of his native city and then at the University of Missouri School of Mines and Metallurgy, from which he graduated in 1915. He pursued graduate study in physical chemistry there and at Harvard University and the University of Chicago.

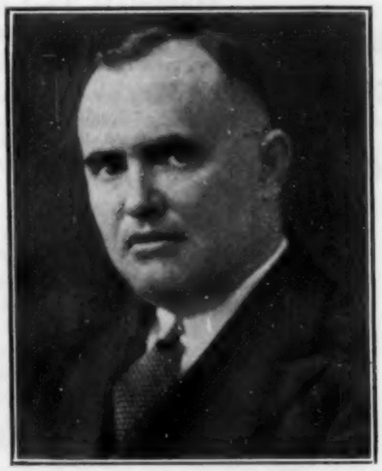
Mr. Dean taught metallurgy at University of Pitsburgh and Armour Institute of Technology and was engaged on metallurgical research for short periods by the Anaconda Copper Mining Company and the American Zinc Lead and Smelting Company. For the past ten years he has been associated with the Western Electric Company at their Hawthorne plant in Chicago, Ill., in charge of metallurgical development.

Mr. Dean's activities in the metallurgical field have been extensive, and the papers published by him and his associates cover investigations in flotation, chemistry of ore deposits, electrolytic refining, theory of metallic hardening, copper wire studies, and alloy studies of various kinds. He is perhaps best known for his work on the dispersion hardening of lead alloys, which attracted widespread attention.

His early interest in physical chemistry applied to metallurgy resulted in his translation of Schenck's "Physical Chemistry of the Metals," which he later rewrote under the title of "Theoretical Metallurgy." In collaboration with L. G. Swenson he also translated Tamman's textbook of "Metallography."

He has been active in technical society work and serves on the Papers Committee and the Douglas Medal Award Committee of

the American Institute of Mining and Metallurgical Engineers and on the Executive Committee of the Chicago Section of that Institute. He represented the Western Electric Company for several years on a number of the American Society for Testing Materials Committees. He is also a member of the American Chemical Society, the British Institute of Metals and the American Society for Steel Treating. In 1924 he received the Chicago Section award for advances in metallurgy.



R. S. Dean

George E. Taylor has been elected vice-president of John C. Wiarda and Company, Brooklyn, N. Y., a division of the Kalbfleisch Corporation, New York, chemical manufacturers.

H. C. Pierce, formerly with the Udylite Process Company, Detroit, Mich., has been appointed general manager of Protective Metals, Inc., Tulsa, Okla. The latter company specializes in electroplating equipment used in the oil industry.

Alvin I. Findley, for the past 25 years editor of "The Iron Age," widely read trade and technical journal of the iron and steel industry, has retired. He is succeeded as editor-in-chief by **William W. Macon,** who has been associated with Mr. Findley for 19 years, the last twelve of which he spent as managing editor. Mr. Findley is now editor emeritus.

James Wills Chamberlain has been made chief engineer and a director of The U. S. Stoneware Company, New York. He is a grandson of James M. Wills, who founded the business in 1865 on the site of what is now Plant No. 1, Akron, Ohio. Mr. Chamberlain is a graduate of the Massachusetts Institute of Technology and has had thorough training and experience in ceramic engineering, both in this country and abroad.

Richard B. Mellon, of Pittsburgh, Pa., an important factor in the Aluminum Company of America, has made an offer of a gift of about $3,000,000, to be used in construction of a new building for the East Liberty Presbyterian Church, Pittsburgh, of which the Mellon family have been life-long members. A stipulation made by Mr. Mellon is that the new church be "modern 100 years from now," embodying every facility that can be envisioned for the future.

Franklin Farrel, Jr., has been elected chairman of the board of directors of the Farrel-Birmingham Company, Inc., Ansonia, Conn., machinery manufacturers. He was formerly vice president. **N. W. Pickering** has been elected president to succeed **Walter Perry,** who has retired after forty years with the company and its predecessor. The following are new vice presidents: **D. R. Bowen,** chief engineer; **Carl Hitchcock,** formerly assistant secretary; **Franklin R. Hoadley,** foundry manager; and **A. G. Kessler,** Buffalo division manager.

A. J. German, chief engineer, Scovill Manufacturing Company, Waterbury, Conn., is planning to attend the World Power Conference, to be held at Berlin, Germany, June 16 to 26, 1930. Other men in the metal industries planning to attend are: **Wylie Brown,** president, National Electric Products Corporation, and president, Habirshaw Cable and Wire Corporation, New York; **Walton S. Smith,** Metal and Thermit Corporation, Carteret, N. J.; **Frederick Attwood,** vice-president, Ohio Brass Company; **Alvan L. Davis,** research engineer, Scovill Manufacturing Company, Waterbury, Conn.

G. L. Draffan has been elected secretary, and **W. A. Springer** treasurer, of the Ohio Brass Company, Mansfield, Ohio. **J. M. Strickler** is now general manager of sales. Mr. Draffan has been with the company since 1916, formerly holding the positions of assistant advertising manager, then assistant secretary and later general sales manager. Mr. Springer was previously assistant treasurer, and Mr. Strickler was assistant sales manager.

G. H. Clamer

The Ajax Metal Company, Philadelphia, Pa., of which G. H. Clamer is president and general manager, is celebrating its fiftieth anniversary this year. In 1880, F. J. Clamer, father of the present head, and J. G. Hendrickson founded the company, starting a small plant at Ninth and Poplar Streets, Philadelphia, moving later to Tenth and Diamond Streets. The present location at Frankford Avenue and Richmond Street was taken in 1888. From a small beginning Mr. Clamer has seen the production of the company grow to about 30,000,000 pounds of non-ferrous ingots annually, and the plant enlarged to 100,000 sq. ft. of floor space, to which 80,000 sq. ft. is now being added, for storage and handling of raw material. Furthermore, the company, because of much pioneering by Mr. Clamer, is a large factor in the production of electric metal making furnaces. He is president and general manager of the Ajax Electrothermic Corporation, Trenton, N. J., which grew out of his interest in electric melting.

G. H. Clamer

When the company began, in 1880, it produced Ajax metal, a copper-tin-lead alloy for bearings, the lead addition being a novel thing then and adding considerably to the utility of the bearings. Previously, copper-tin alloys had been used. The company also started a rolling mill and produced various non-ferrous sheet products, but it was later eliminated in favor of a department for the manufacture of bearings for cars and locomotives, which was operated until 1928. Now the company produces non-ferrous ingot metal exclusively, including a complete line of white metals.

The pioneering in electric furnaces which Mr. Clamer did is generally considered to have been the largest factor in bringing the high frequency, induction type of melting equipment up to its present high efficiency. It is used a good deal in non-ferrous work, but its chief purpose is for melting alloy steel. A very recent development is the electric furnace for zinc base alloys. The furnace manufacture is carried on at Trenton, by the Ajax Electrothermic Corporation, which is now in a new plant there. Mr. Clamer is also largely responsible for the development of the Ajax-Wyatt induction furnace which has revolutionized brass melting in the rolling mills.

Another distinction credited to Mr. Clamer is that he was one of the first chemists in the brass industry. Born in Philadelphia and educated at the public schools and the University of Pennsylvania in that city, he joined his father's company in 1897 as a chemist, and succeeded his father as vice-president in 1900. For his work in metallurgy he has been awarded several high honors. He was president of the American Foundrymen's Association in 1924, and member of its board of directors from 1920 to 1927. He has been president of the American Society for Testing Materials, and is active in the Franklin Institute, Philadelphia scientific organization. Mr. Clamer is now chairman of a committee seeking to standardize copper alloys for sand casting, and he continues actively to pursue a number of other lines of work important to the non-ferrous metal industries.

Arthur V. Davis, president of the Aluminum Company of America, Pittsburgh, Pa., went to Bay City, Mich., with a party of friends to attend the launching of his new 140-foot all-steel yacht, the "Elda," on April 5.

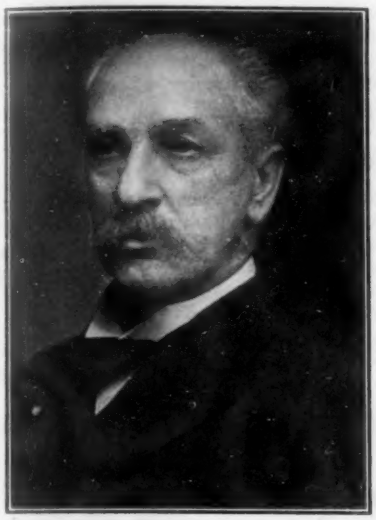
Arthur Curtis James, who has been for many years an important figure in the Phelps Dodge Corporation, New York, has removed his offices from 99 John Street, New York, to 40 Wall Street. Mr. James' family maintained offices at the John Street address for about 110 years, staying through many reconstructions of the buildings there. Among his effects, Mr. James took along two old brass andirons.

Obituaries

Elwin R. Hyde

Elwin R. Hyde, for forty years president of the Bridgeport Safety Emery Wheel Company, Bridgeport, Conn., died of heart disease on March 25, 1930, at his home in that city.

Mr. Hyde's first contact with the abrasive industry was in 1876, when he had charge of the exhibit of the Northampton Emery Wheel Company at the Philadelphia Centennial Exhibition. Then he became a salesman for the Union Stone Company, Boston.


Elwin R. Hyde

In 1879 Mr. Hyde was offered the position of manager of sales and manufacture by the Union Stone Company; he declined, but was instrumental in placing a cousin in this position, Harlan F. Hyde.

Having refused the position with the Union Company, E. R. Hyde started experimenting in the manufacture of wheels at Springfield, Mass., and in 1880 formed the Springfield Glue and Emery Company. Associated with him in this enterprise were his brothers, D. B. Hyde, C. L. Hyde, and O. H. Hyde and also T. D. Homan.

Mr. Hyde invented and developed the first automatic knife grinder, with the cross feed of the knife bar to the wheel, and which was arranged to be stopped at any particular point the operator wished. In 1883 he designed the wet tool grinder, which then supplanted very largely the grindstone in the sharpening of tools in industries throughout the world. In 1890 the concern moved to Bridgeport, where a large plant was put up.

The Hyde brothers and Mr. Homan withdrew from the Springfield Glue and Emery Company in 1893, O. H. Hyde and D. B. Hyde removing to Springfield, Ohio, forming the Safety Emery Wheel Company, while E. R. Hyde and C. L. Hyde, together with Mr. Homan, formed the Bridgeport Safety Emery Wheel Company in Bridgeport.

Charles F. Beck

Charles F. Beck, assistant superintendent of the finishing department of the Yale and Towne Manufacturing Company, Stamford, Conn., died there on March 30, 1930, after several months' illness. He was 53 years old and had been with Yale and Towne for about 29 years.

In 1901, Mr. Beck went with Yale and Towne as a plater. He was later promoted to the position of foreman of the finishing department and again to general foreman of that department. On March 1, 1927, he became assistant superintendent. He was very active in the social functions of the plant, being a member of the Trefoil Club, Panel Club, Mutual Benefit Society and Industrial Association. He was a veteran of the Spanish-American War. As a plater, he was well known, outside as well as within the Yale and Towne organization.

Mr. Beck is survived by a daughter, a sister and a brother.

Charles F. Irons

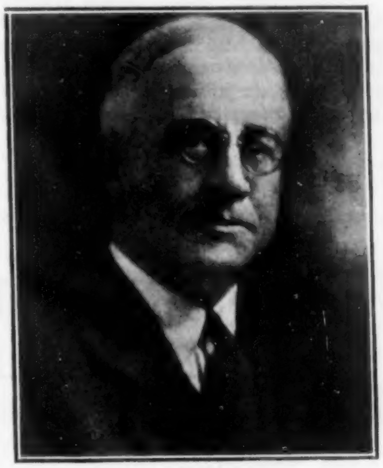
Charles F. Irons, of the Irons and Russell Company, Providence, R. I., manufacturing jewelers, died on April 6, 1930, in his ninety-first year. He was ill for only a week before he died.

Mr. Irons was born in Providence and educated in the public schools there. In 1861, when he was twenty-two, he started a jewelry manufacturing business, operating under his own name for some years. When he took in his nephew, Charles A. Russell, as partner, the firm name was changed to its present form.

Some years ago, Mr. Irons was a member of the Rhode Island Legislature.

Francis D. Wanning

Francis D. Wanning, vice-president of the Farrel-Birmingham Company, Ansonia, Conn., manufacturers of metal working and other machinery, died at New Haven Hospital on April 7, 1930, after six months' illness. He was fifty-seven years old.


Francis D. Wanning

Mr. Wanning was born at Shelton, Conn., in 1873. He entered Yale University in 1891, graduated in 1894, and entered the employ of the Birmingham Iron Foundry, which is now a part of the Farrel-Birmingham Company. After some time in the engineering department, Mr. Wanning became secretary of the company. When the company merged with the Farrel Foundry and Machine Company, he was made vice-president and chairman of the executive board of the consolidated firm. He was in the industry for thirty-five years. He had other industrial and business interests, including directorships in the Derby Gas and Electric Company, the Shelton Water Company, the Housatonic Water Company, Birmingham National Bank, etc. Also, he was a former president of the Manufacturers' Association of Lower Naugatuck Valley, and member of a number of other organizations.

Mr. Wanning is survived by his widow, three children, and his parents.

William M. Rule

William Mansfield Rule, for many years an employee of the American Brass Company, at Waterbury and Torrington, Conn., and later general manager of the Michigan Copper and Brass Company, Detroit, Mich., died at his home in Detroit on April 21, 1930, after 10 days' illness.


William M. Rule

Mr. Rule was born in Cheshire, Conn. He came to Waterbury as a young man and was employed by the American Brass Company factories in that city and in Torrington. He was also superintendent and general manager of the Ball Bearing Shade Roller Company of Naugatuck for 10 years, leaving there in 1919 to become general manager of the Michigan Copper and Brass Company.

He is survived by his widow, Alice Lombra Rule, formerly of Yalesville, Conn. —W. R. B.

George H. Benham

George Hurd Benham, 79, formerly treasurer of Holmes, Booth and Hayden Manufacturing Company, Waterbury, Conn., died at his home in Woodbury, Conn., on April 9, 1930. He entered the employ of the firm in 1877 as a bookkeeper and was soon advanced to treasurer. He continued in the employ of the company after its merger with the American Brass Company until 1920.

Mr. Benham was born in Woodbury, November 27, 1850, and was educated in the schools of that town. He was married in 1872 to Antoinette Judson of Woodbury. He is survived by two daughters, Miss Edith L. Benham of Woodbury and Mrs. Frederick S. Cooke of Waterbury. —W. R. B.

Augustus H. Bullard

Augustus Hall Bullard, secretary and treasurer of the Bullard Company, Bridgeport, Conn., died on April 5, 1930. He was 63 years old. He assisted his uncle, E. P. Bullard, in forming the Bridgeport Machine Tool Company, predecessor to the Bullard Company, in 1886. He was active in the affairs of the local and state manufacturers' associations for years. He leaves his wife, formerly Ellen Nurnham, a daughter, Helen, and a son, John; also, a brother, Walter H. Bullard, of Orange, Mass.

—W. R. B.

George W. Davis

George W. Davis, formerly a manufacturer of jewelry and tools at Providence, R. I., died in his seventy-seventh year on April 6, 1930. Eleven years ago, due to poor health, he retired from the business he had operated for twenty years.

Mr. Davis is survived by his brother, Charles Davis, of East Providence, a sister, and two daughters.

Henry T. Sperry

Henry T. Sperry, for many years a foreman at the plant of the Chase Companies, Inc., Waterbury, Conn., died on April 4, 1930, at his home, 17 Kendrick Avenue, Waterbury. He was 85 years of age. Mr. Sperry is survived by a number of grandchildren, nephews and nieces. —W. R. B.

William G. Wherry

William G. Wherry, president of the Skillman Hardware Manufacturing Company, Trenton, N. J., died at his home in that city on April 28, 1930. He was 47 years old. Mr. Skillman was also president of the Wherry and Hutchinson Electrical Supply Company, Trenton.

—C. A. L.

News of the Industry

Industrial and Financial Events

Brass Ingot Statistics

On April 1, unfilled orders for brass and bronze ingots and billets on the books of the members of the Non-Ferrous Ingot Metal Institute, Chicago, Ill., amounted to a total of 7,537 net tons, according to an announcement of the Institute.

The average prices per pound received by its membership on commercial grades of the six principal mixtures of ingot brass during the twenty-eight day period ending March 28 were as follows:

Grade	Cents per lb.
Commercal 80-10-10 (1% impurities)	16.335
Commercial 78% metal	14.868
Commercial 81% metal	15.075
Commercial 83% metal	15.300
Commercial 85-5-5-5	15.538
Commercial No. 1 yellow brass ingot	12.300

The combined deliveries of brass and bronze ingots and billets by the members of the Institute for the month of March amounted to a total of 6,632 tons, according to the announcement.

Harshaw Chemical Company Expansion

The Harshaw Chemical Company, manufacturers of nickel anodes, salts and chloride, chromic acid, cadmium anodes, cadmium oxide, and distributors of sodium cyanide and a full line of heat treating and plating chemicals, have just purchased a four-story building at 1945 East 97th Street, Cleveland, Ohio, to house the executive and sales offices and laboratories. The building comprises about 20,000 square feet of floor space and it offers ample room for expansion and continued diversification in new lines of products which the company will develop. It stands on a four-acre tract which was also purchased and will be available for new buildings as required by contemplated expansion.

The move to this large building calls attention to the growth of the Harshaw business, founded in 1892 in a very modest way. The first office was under the old Superior Street viaduct in Cleveland. Then for many years offices were maintained in the Electric Building. For the past eight years the offices have been in the Hanna Building. Branch offices are maintained in Chicago, New York, and Philadelphia, and the company is represented with stocks and offices in most of the large consuming centers of the country.

The company has just completed a new and modern factory for producing metallic colors at Elyria, Ohio, where they also have new offices. Two large buildings and equipment have been bought adjoining the Elyria plant, where new products are to be produced. At Philadelphia a new warehouse and office building has been constructed and at the Cleveland plant land has been purchased for expansion.

The expansion program has called for changes in organization and personnel during the past year, the most noteworthy of which is the addition to the executive group of William B. Lawson as vice-president. To join the Harshaw Chemical Company organization, Mr. Lawson resigned as director of sales of the International Nickel Company of Canada, Ltd. He had been associated with the International Nickel Company for the last twenty-five years.

Huge Copper Merger Is Planned

Plans were announced last month for a merger of two large Arizona copper producing companies, the Phelps Dodge Corporation and the Calumet and Arizona Mining Company, into a concern with assets of more than $325,000,000. It was also intimated that the Nichols Copper Company might be involved in the merger, since the three companies operate jointly the Phelps Dodge Sales Corporation, New York, the marketing agency for the copper produced by the three, also a refinery at El Paso, Texas.

Walter Douglas has retired from the office of president of the Phelps Dodge Corporation and has been succeeded by Louis S. Cates, formerly vice-president and general manager of the Utah Copper Company. Mr. Douglas had been desirous of giving up active business for some time.

Metal Tariff Rates Adjusted

The Tariff Conference Committee, consisting of members of the two houses of Congress, has adjusted the tariff rates on metals and metal products as proposed under the Hawley-Smoot Bill now being considered by Congress. Among the important changes was an upward revision in the duties on aluminum and aluminum utensils. The Senate recently decided upon a rate of 2 cents per pound on new and scrap aluminum and aluminum alloys, as against the existing rate of 5 cents. The conferees of the House and Senate, however, have revised this to 3½ cents. On fabricated articles of aluminum a rate of 7 cents was agreed upon, as against

the existing rate of 9 cents. This rate had been placed at 3½ cents by the Senate recently. On kitchen utensils and other household articles of aluminum, a rate of 8½ cents plus 40% ad valorem has been agreed upon, as compared with the existing rate of 11 cents plus 55% ad valorem, which the House had voted to maintain and the Senate had voted to lower to 25% ad valorem only.

Rates on clocks and watches have been raised and a complex scale of rates on movements, parts, cases, etc., arranged. Other revisions touched aluminum foil; tinsel; bronze and aluminum powder; bullions and metal threads; metal beltings and woven fabrics; metal articles, not specifically provided for, not plated or lacquered; safety razors and parts.

A complete schedule of tariff on metals and metal products will be published as soon as the bill has been completed and passed.

Crucible Companies Merge

Chicago Crucible Company, Chicago, Ill., and the Naugatuck Valley Crucible Company, Shelton, Conn., have been taken over by a newly formed company which will operate under the name of the Chicago-Naugatuck Crucible Company. This company will use the Shelton concern as its eastern division and the Chicago firm as the western division, the latter having headquarters at 2525 Clybourn Avenue, Chicago. Factories are located in both cities. Officers of the new company are: D. N. Clark, president and general manager; Adolph Hottinger, vice-president and technical adviser; William MacFadden, vice-president and general sales manager; F. S. Jerome, treasurer; C. S. Boies, secretary.

Murray Radiator Corporation Sold

The Murray Radiator Corporation, Brooklyn, N. Y., has been sold to the American Radiator and Standard Sanitary Company, according to an announcement by the Thomas E. Murray Estate. The price is placed at between $5,000,000 and $6,000,000. Thomas E. Murray, Jr., has been elected a director of the purchasing company. The Murray firm manufactures light weight copper radiators invented by the late Thomas E. Murray.

Stewart Die Casting Corporation

Stewart Die Casting Corporation, Chicago, Ill., a subsidiary of the Stewart Warner Corporation, is producing a line of aluminum household utensils, which are to be marketed by a nation-wide distributing organization. The trade mark "Stewart Cookware" will be used and utensils will be sold in the company's sales branches, salesrooms of public utilities and department stores.

Unfair Metal Marking Stopped

The Federal Trade Commission, Washington, D. C., has issued a report covering cases of unfair methods of competition which were disposed of by the signing of stipulations in which the concerns involved agreed to cease and desist from the practices charged. Names of the concerns were not made public, in accordance with the Commission's policy, but the facts in each matter were given. One case which interests the metal fabricating and plating industries is No. 437, in which the involved concern, manufacturers of silverware, cutlery and novelties, agreed to discontinue "using the words 'Nickel Silver,' 'Platinum Finish,' and 'Gold Lined' to designate products not so composed, and using price markings in excess of those at which it is intended such articles shall be sold."

Midland Metals Company Sold

The Midland Metals Company, Chicago, Ill., has been purchased by the Reynolds Metals Company, and will be operated as a division of the latter, under the new name Midland Foil Company. The Midland firm manufacturers foil for the cheese industry, doing gross business of $1,750,000 last year.

Much Metal for New Waldorf-Astoria

General Bronze Corporation, Long Island City, N. Y., has been awarded contracts for a large amount of ornamental bronze, iron, aluminum and nickel for the new Waldorf-Astoria Hotel, now under construction in New York City.

Bridgeport Brass Company

Bridgeport Brass Company, Bridgeport, Conn., declared a dividend of $1.50, payable April 29, 1930. The last previous dividend was $2, paid December 23, 1929.

Company Earnings Reports

International Silver Company, Meriden, Conn., and subsidiaries report for three months ended March 31, 1930, net profits of $168,148 after depreciation and Federal taxes, comparing with $269,819 for the corresponding 1929 period.

Bohn Aluminum and Brass Corp., Detroit, Mich., reports net income of $395,386 for the three months ended March 31, 1930, as compared with $1,019,753 for the corresponding 1929 period.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Connecticut

May 1, 1930.

Although the financial statement issued last month showed net earnings for the past year of $93,000, the directors of the **Beardsley and Wolcott Manufacturing Company** voted to omit the regular dividend for the time being, explaining their action by saying: "We believe we are best protecting the stockholders' interest by this decision and feel certain that in delaying dividends we have the stockholders' approval, if in so doing it will help the progress and expedite the growth of the company."

Local clock manufacturers are pleased to learn that the conference between Senate and House leaders has resulted in some slight increases in the tariffs on clocks and watches. The compromise rates, although much less than those given in the House bill, are higher than the rates in the Senate and slightly higher than the existing rates.

Fred A. Jackle, works manager of the **Chase Companies, Inc.,** is on a trip to the South. On his return he will visit the new Chase plant at Cleveland. **Patrick J. Whiston** has been made superintendent of the sheet mill at the **Chase Metal Works,** succeeding **Frank Walsh,** who has become superintendent of that department in the Cleveland plant. **Harry Walsh** will be Mr. Whiston's assistant. **William Graham** has been made superintendent of the tube mill, succeeding **Walter Smith,** now superintendent of that department at Cleveland.

Mayor Frank Hayes plans to call a conference of the heads of all the local factories in an attempt to see if more men cannot be given work, even if only on part time.

Rodney Chase, advertising manager and assistant secretary of the **Chase Companies,** described his recent trip to Europe at the recent meeting of the Chase Foremen's Association. A motion picture, "New Pipes for Old," showing manufacture of pipes and other brass goods at the Chase mills was shown.

Sales executives of the **Scovill Manufacturing Company, American Brass Company, Chase Companies,** and of other concerns in this and other cities of the state, attended a meeting at the Waterbury Club last month to discuss ways of increasing foreign trade.

Merger of the **Plumbers Brass Goods Foremen's Association and the Scovill Foremen's Association** has been effected. The former is the association of the foremen of the former **American Pin Company,** now owned by Scovill's.

John H. Goss, vice-president and general superintendent of the **Scovill Manufacturing Company,** has been named a di-

rector of the **United Founders Corporation,** following the acquisition by the latter of the control of the **American Founders,** of which he had been a director.

Frederick S. Chase, Edward L. Bradley, Walter A. Jarvis, Charles B. Slater, William G. Green, George Conlong and E. Roland Chase of the **Chase Companies;** Charles Cosgrove of the **Autoyre Company;** John S. Visscher of the **Scovill Manufacturing Company,** Samuel Morgan of the **American Brass Company,** Fred Burnes of the **Waterbury Brass Goods Company,** Charles Weber of the **Noera Manufacturing Company,** Richard L. Wilcox, F. L. Squire and William J. Secor of the **Waterbury Farrel Foundry,** William Thuemmler of the **American Ring Company,** L. J. Hart of the **Patent Button Company,** Charles E. Beardsley, Robert S. Booth and Melvin Wallace of the **Beardsley and Wolcott Company,** J. R. Putnam of the **Waterbury Clock Company,** Herman Koester of the **Bristol Manufacturing Company,** and William Pickard of the **American Metal Hose Company,** attended the session of the industrial department of the **New England Council** held here last month. The session was devoted principally to talks on the elimination of waste as a method of meeting competition. Conservation of heat, light, power, salvaging of scrapped materials and taking advantage of new processes were stressed. "The difference between profit and loss often consists in the little things that frequently can be found in the by-products," F. S. Chase, president of the Chase Companies, declared.

Morris H. Bennett, assignor to the **Scovill Manufacturing Company,** has been granted a patent on a condenser. **Edmund Janes,** assignor to the same company, has been granted a patent on a self-locking slide fastener; **Paul Fenton,** assignor to the same, a patent on a slide fastener; and **C. R. Summa** a patent on an oil can.

—W. R. B.

Connecticut Notes

MAY 1, 1930.

BRIDGEPORT—Edmund S. Wolfe, president of the First National Bank, has been elected a director of the **Bridgeport Brass Company,** succeeding the late **Charles G. Sanford.**

A decree enjoining the **Gamble Stores, Inc.,** and **Gamble Skogmo, Inc.,** has been handed down by Judge Hugh Morris of the United States District Court, forbidding those concerns to sell "Weed" tire chains at prices less than the current normal retail list price at which they are sold in the territory where they have stores. The action was brought by the **American Chain Company** of this city on the ground that the defendants were selling the chains in local territory at less than the local company is selling them.

The Bullard Company has announced its purpose of extending to the general trade the privilege of using the Bullard-Dunn process for removal of scales, oxides and other foreign matter from metal surfaces, intending to permit the use of the process on the basis of a license charge and royalty fee based on the electric current requirements of the work to be performed. (See THE METAL INDUSTRY, April, 1930, page 187.)

HARTFORD—Veeder-Root, Inc., has acquired the controlling interest in the **Holo-Krome Screw Corporation.** The latter was organized by men engaged in the hollow set screw and cap screw industry. Directors of Veeder-Root have declared the regular quarterly dividend of 63 cents a share, payable May 15 to stock of record April 30.

All officers and directors of the **Colt's Patent Fire Arms Manufacturing Company** were reelected without change at the annual meeting last month.

TORRINGTON—Officials of the local manufacturing plants admit they do not know when work will return to normal as the orders are not coming in as they should, and until they do the plants will remain on short time with a small number of employes. At one local plant where 16 married women were employed, 15 of them were released; the unmarried girls were kept; in most instances husbands of the married women are employed, although on short time, while the fathers of the single girls have been unemployed for several months. Mayor **E. E. Novey** is attempting to have the city start more public projects to relieve the unemployment. The unemployment is mostly among the unskilled, as skilled men such as toolmakers and automatic machine operators are being hired frequently.

The half-million dollar addition to the plant of the **Hendey Machine Company** is rapidly nearing completion and is expected to be ready for occupancy within two months. This concern at its annual meeting last month reelected its officers.

MIDDLETOWN—Continental Casting Company, a subsidiary of the **Welker-Hoops Manufacturing Company,** has acquired the old Westinghouse factory and is planning to produce die castings, die casting equipment and permanent mold castings.

WALLINGFORD—A sword of gold, silver and enamel will be produced here by the **International Silver Company,** to be presented to **Rear Admiral Richard E. Byrd** by the state of Virginia, upon his return from the Antarctic. The body of the scabbard will carry reproductions of the Byrd ships at the Ross barrier.

NORWALK—Segal Lock and Hardware Company, which recently acquired the **Norwalk Hardware Company,** is offering to common stockholders $700,000 of 6½ per cent convertible bonds in ratio of $700 of bonds for each 100 shares. Proceeds will be used to liquidate obligations incurred in the acquisition of additional properties.

COLLINSVILLE—Directors of the **Collins Company** have declared the regular quartely dividend of $2 a share payable May 2.

UNIONVILLE—Bourne-Fuller Company is now under the management of the **Republic Iron and Steel Corporation** and it is expected that a change in name will be made shortly. The company manufactures bolts and nuts and gives employment to about 200 hands.

BERLIN—Directors of the **G. E. Prentice Manufacturing Company** have declared a regular quarterly dividend of 2 per cent and an extra dividend of 2 per cent.

WINSTED—The plant of the former **New England Pin Company** here has been sold to the **New England Knitting Company,** which is now installing machinery.

—W. R. B.

Middle Atlantic States

Newark, New Jersey

MAY 1, 1930.

Vice-Chancellor Backes has appointed **Alexander T. Schenck,** a Newark lawyer, receiver for the **Schickerling Radio Tube Company,** 401 Mulberry Street. The bond was fixed at $1,000. The order was made by consent. **Arthur T. Vanderbilt,** who made the application, submitted data showing the company had assets of $45,000 subject to a chattel mortgage of $25,000 and other liabilities, totaling considerably more than the assets. The property is scheduled to be sold under foreclosure proceedings.

Samuel Kaufman, Newark, has been appointed by **Vice-Chancellor Backes** as receiver for the **Chemical and Dye Corporation,** Springfield, N. J. Stockholders and creditors are ordered to show cause why the receivership should not be continued. Kaufman's bond was fixed at $20,000. Consent to the action was filed by counsel representing creditors and officers of the company. Application for the receivership was made by **William B. Johnson,** representing **C. Herbert Gleason,** a stockholder and director of the concern, which has a plant also at Ashland, Mass. Assets are given as approximately $300,000 and liabilities at $80,000. Insolvency is not charged, but the action was declared to be based on internal dissension and inability to elect a board of directors.

The following Newark concerns have been chartered: **Unific Cutlery Company,** manufacture toys; $100,000 capital. **Solondz Brothers Company, Inc.,** manufacture screens; $100,000. **American Alloy Company,** minerals; 2,500 shares common. **Van Gytenbeek Manufacturing Company, Inc.,** manufacture metal goods; $20,000. **Chloromite Corporation of America,** manufacture chemicals; $50,000 preferred and 2,500 shares common. **Brach Electric Clock Corporation,** electric clocks; $100,000. **National Incandescent Lamp Company,** Newark; manufacture lamps; $125,000.

—C. A. L.

Trenton, New Jersey

May 1, 1930.

The metal industry plants in Trenton are feeling the sting of depression now existing throughout the country and some of them are operating below normal. The big plant of the J. L. **Mott Company** is working but a few days a week. The **Edgely Brass Company** reports a falling off in orders.

Labor representatives have succeeded after a hard fight in winning favorable action by the Legislature on a bill to safeguard workers in the trades. The battle was fought in the House with **Senator Arthur A. Quinn,** president of the State Federation of Labor, looking after the interests of the workers. **Assemblyman F. Stanley Bleakly,** of Camden, offered amendments which the labor men declare would have nullified the bill by eliminating nearly all of the penalties for violations. For a time the proposed changes escaped the notice of the proponents, but when they learned of the situation they at once got busy. Finally, Senator Quinn mustered enough votes to have the amendments reconsidered.

Standard Underground Cable Company has let a contract for an addition to the plant, to cost $20,000.

Alloys Foundry Corporation has been formed to manufacture aluminum heat-treated alloy castings and will operate a plant at West Paterson. The officers are **C. B. Brown,** president; **Harry G. Lamker,** secretary and treasurer, and **Harold J. Neff,** vice-president. Mr. Lamker was formerly superintendent of the **Wright Aeronautical Corporation**; Mr. Neff is a former sales manager of the **Walker M. Levett Company,** New York.

The following concerns have been incorporated here: **Joseph B. Hernandez Corporation,** Bayonne; manufacture metal lath; 1,000 shares. **Arab Chemical and Engineering Company,** Camden; chemicals; $125,000. **Lincoln Laboratories,** Paterson; chemicals; $125,000. **Garfield Screen and Weatherstrip Company,** Jersey City; manufacture screens; $10,000. **Fred Del Sordo, Inc.,** Union City; manufacture radio tubes; 1,000 shares. **Heller & Mertz Corporation,** Jersey City; chemicals; 1,000 shares. **Monmouth Stamping Company,** Matawan; metal stamping; $25,000. **Select-O-Lite Corporation,** Paterson, manufacture lamps; $125,000. **General Gilless Bearing Company,** New Brunswick; manufacture bearings; $100,000.

—C. A. L.

Middle Western States

Detroit, Michigan

May 1, 1930.

Non-ferrous metal plants in this area again are stepping up production moderately. While the volume is far from what was anticipated a month or two ago, it is sufficient to indicate these plants are bound to make a considerable showing for the first half of the year. Practically all the plants are operating, but most of them are on part time.

The airplane industry, which has great promise for the coming year, is aiding these plants materially. More planes will be manufactured in the Detroit area in 1930 than during any previous year. Conditions in the motor car industry, however, are not so promising.

The plating plants are somewhat more favorably situated. They do not have to depend entirely on the motor car industry. Most of them are quite busy now, although they are not operating to the rate that was maintained a year ago.

For several months manufacturing jewelers have experienced a quiet time. Some are on decidedly curtailed production.

Consumers Metal Corporation, 12th street and West Jefferson avenue, is a new Michigan corporation. The capital stock is $100,000. This concern is engaged in refining metals. The owners are **Harry Gittlen, Joseph Davidson** and **Alex Gittlen.**

National Smelting and Refining Company is erecting a new warehouse on West Jefferson avenue and the Detroit, Toledo and Ironton Railroad.

According to **H. W. Burritt,** vice-president in charge of sales of the **Kelvinator Corporation,** manufacturers of electric refrigerators, March was the greatest month from a business standpoint his company has ever experienced. National Sales of **Copeland Products, Inc.,** manufacturers of electric refrigeration units, also are at record-breaking levels.

One of the interesting exhibitions at the recent airplane show in Detroit was that of the **Bohn Aluminum and Brass Corporation.** This concern is a leader in the production of bearings for aircraft engines. The Bohn organization, for years has made a study of aeronautical requirements, employing experts who are authorities in this particular field.

Owing to the increased demand for electric refrigeration units a considerable impetus has been given to tin plating in this area. This type of plating is used on coils and similar parts, because of the high resistance of tin to corrosion. One entire floor is given over to this work by the **General Chromium Plating Corporation,** 3220 Bellevue avenue. The refrigerator manufacturing industry in Detroit and suburbs has made rapid progress in the past year and the present summer seems to promise still greater strides.

The Metal Finishing Research Company was recently incorporated at Morenci, Mich. The capital stock is $50,000 no par value. This concern does research on processes and products pertaining to the cleaning and protection of metals.

Production of the **Stinson Aircraft Corporation,** at Wayne, a suburb of Detroit, increased 31 per cent in March over February, according to **William A. Mara,** vice-president. At the same time Mr. Mara announced that, based on figures available for the first 100 planes manufactured by Stinson, the manufacturing savings under quantity production methods adopted this year and under standardization of parts, models and specifications, have been seventy per cent as compared with 1929.

—F. J. H.

Wisconsin Notes

May 1, 1930.

Christian Scholtka, 75, a director of the **Roberts Brass Company,** Milwaukee, died on April 16, at the Milwaukee Hospital after an illness of six months. Mr. Scholtka wah active in civic and club affairs of Milwaukee and was also one of the founders of the Nordberg Company. He is survived by his widow, a daughter and a grandson.

Elmer J. Loew has resigned from the sales department of the **West Bend Aluminum Company,** West Bend, to take a position with **Lyon Metal Products, Inc.,** Aurora, Ill.

F. H. Suss, sales manager for the **Starcast Aluminum Company,** was recently named a director of the Deutscher Klub, Inc., a society of Milwaukeeans of German descent.

The Alloy Metal Products Corporation, Milwaukee, has just completed what is declared to be one of the largest milk tanks ever built. The tank is 10 feet in diameter and 14 feet long, with a capacity for 5,000 gallons of milk. It weighs six tons and has been made for the Libby, McNeil and Libby dairy plant at Waupun, Wis. The Alloy Metal Products firm was organized a year ago and operated a tinning process for milk cans. From milk cans the company gradually emerged to larger dairy equipment, truck tanks, cheese vats, weighing cans, pasteurizers and coolers. Officers of the firm, which employs 38 people, are **W. J. Wachowitz,** president; **Walter Sherman,** vice-president; **Earl A. Koehler,** treasurer.

American Brass and Aluminum Foundry Company, Racine, has been awarded a contract for the manufacture of several hundred stationary traffic signs for the city of Racine. All the signs will be faced with aluminum. They will cost $2,723.16.

An improvement in industrial production is reported by the **Aluminum Goods Manufacturing Company,** operating plants in Manitowoc and Two Rivers. The employment force in the early part of April of this year numbered 3,600 as compared to 3,300 a year ago.

Gustave Boettger, 70, for many years a member of the silver plating firm of Boettger and Wittig in Milwaukee, which he founded, died at his home in that city on April 2, after an illness of two years. He is survived by three daughters and one son.

—A. P. N.

Other Countries

Birmingham, England

April 21, 1930.

The metal trades in the Birmingham district have been under the influence of the general depression prevailing in the district, which is reflected in the increase in unemployment and short time working at some of the mills. Among the rollers of non-ferrous metals, some manufacturers are busy but it is explained that this is only because there are contracts on the books to be completed. Where activity depends upon incoming orders, work has had to be slowed down. Firms who cater to the automobile industry (which is largely centred in Birmingham and Coventry), have found that there has been a scarcity of orders for component parts in brass, copper, aluminum and other metals. There are now signs that the motor car industry is reacting to the approach of the Summer, and a good season is anticipated shortly. Brass foundry operations for the building trade are improving.

The export trade is disappointing, particularly in regard to Australia, owing to the heavy tariffs against British goods. The Birmingham jewelry trade is likely to be adversely affected by the luxury tax recently imposed by Australia.

The British Institute of Metals announces amongst its forthcoming meetings the plans for the Autumn meeting of 1932, to be held in the United States and Canada. These arrangements are now taking definite shape, owing to the energetic action of a special reception committee of the Institute's prospective hosts in the United States—the American Institute of Mining and Metallurgical Engineers. The visit will include official meetings of the Institute in New York and joint meetings with allied societies in Detroit and Toronto. Other places to be visited include Pittsburgh, Cleveland, Chicago, Niagara Falls and Montreal. In all of these cities plants will be opened for the inspection of members of the Institute. The party is expected to leave Southampton on September 3, 1932; the meeting in New York to begin on September 11, and the return journey to start from Montreal on September 30.

At the annual meeting of the British Aluminum Company, held recently, Chairman S. H. Pollen pointed out that the increase in the demand for aluminum is directly due to the extended appreciation of its quality and its peculiar suitability for a very wide variety of purposes. It is now being largely used as component parts in automobiles, railways, aircraft and shipbuilding, because the outstanding property of aluminum and its alloys is their strength combined with lightness, he said. The company has a large plant at Locharber, Scotland, where aluminum is produced from the ore, which is brought from France. They have been pioneers in the hydroelectric development and in the production of aluminum in Scotland.

—J. A. H.

Business Items—Verified

MacDermid, Incorporated, Waterbury, Conn., has announced the removal of its factory and offices to 526 Huntingdon Avenue, Waterbury.

The Wallace G. Imhoff Company, consultants in zinc coating, hot galvanizing, etc., have removed to Vineland, N. J., from their former location at Pittsburgh, Pa.

Munning and Munning, Memphis and Tioga Streets, Philadelphia, Pa., has been formed to manufacture and distribute electroplating, buffing and polishing equipment and supplies.

Phelps Dodge Corporation, the Phelps Dodge Sales Company, Inc., and the Old Dominion Company, formerly at 99 John Street, have removed their offices to 40 Wall Street, New York.

Dallas Brass and Copper Company, division of **Revere Copper and Brass, Inc.,** has changed its address to 2200 North Natchez Avenue, Chicago, Ill. This links the mills and general offices and centralizes the company's facilities.

Foxboro Company, Foxboro, Mass., manufacturers of instruments, gauges, thermometers, etc., will have an addition of three stories and basement, for which contracts have been awarded. Other improvements are also planned.

The Platinum Shop, Inc., Indianapolis, Ind., has been established to engage in manufacture of Jewelry. Capital stock consists of 100 shares of $100 par value each. Incorporators are **Louis Bassler, Joseph M. Bassler** and **Leo Lefkovits.**

Eastern Felt Company, Winchester, Mass., manufacturers of the "U. S. A." brand of felt polishing wheels and also sheet felt, etc., has taken over the **A. B. Dargo Company,** 10 High Street, Boston, Mass. The acquired business has been removed to the Winchester plant.

The DeVilbiss Company, Toledo, Ohio, manufacturers of spraying equipment, reports rapidly expanding European business. **President Allen Gutchess** and **Export Manager Rex Wells** have gone abroad for several weeks and will confer with the company's London and Paris plant executives.

Atchison Specialty and Manufacturing Company, Atchison, Kan., has under way a new brick building, to be used as foundry and machine shop, which will be equipped for production of brass, aluminum and iron castings. **George E. Cooke** is president, and **Charles Cooper** works manager of the company.

R. H. Rhoads, 319 B Quarters, Quantico, Va., contemplates installation of a small chromium plating unit and desires the names of manufacturers or dealers in suitable anodes and other equipment. He is also interested in copper and nickel plating equipment and supplies necessary for plating before applying chromium.

The new type Lockheed-Sirius monoplane flown in record time by **Col. and Mrs. Charles A. Lindbergh** from the Pacific Coast to New York on April 20 was powered by a 450 horsepower Wasp engine manufactured by the **Pratt and Whitney Aircraft Corporation,** Hartford, Conn. The entire trip was made at a 3-mile altitude.

Winnipeg Brass, Ltd., Winnipeg, Manitoba, Canada, has completed construction of a new plant of two stories and basement, 50 x 200 feet, equipped to manufacture brass, bronze and aluminum products, chromium plated work, etc. Winnipeg Brass Company was recently taken over by **Canadian Bronze, Ltd.,** Montreal, which is operating as a subsidiary. Company operates foundries and plating, polishing, grinding and stamping, and lacquering departments.

Lehman Sprayshield Company, 2514 North Broad Street, Philadelphia, Pa., is planning the installation of a complete nickel and chromium plating division, for finishing its products, consisting of bathroom devices. The company, according to **L. H. Lehman,** is interested in the purchase of a complete plant, but if none is available will install new equipment for a plant to employ three or four men. A generator of about 1,500 ampere capacity will be used.

C. J. Tagliabue Manufacturing Company, Brooklyn, N. Y., now located in the Bush Terminal, will remove to the American Tobacco Company property which it has acquired on Park Avenue, from Nostrand Avenue to Sanford Street. This will give the company more than double its present space. Alterations will start at once and occupancy will be possible in July. All modern conveniences will be included in the new plant: there will be research and experimental laboratories, a hospital and a restaurant.

American Machine and Metals, Inc., will be the name of a new company being formed by the officials of the **Manhattan Electrical Supply Company,** 15 Park Place, New York City. The new company, to be incorporated with 500,000 shares of no par stock, will take over and operate the electrical company and subsidiaries, including the **Troy Laundry Machinery Company,** New York; **United States Manganese Corporation; Trout Mining Company; Halliwell-Shelton Electric Company,** New York. Expansion will be carried out after the corporate affairs are worked out. Another subsidiary is to be formed under **Manhattan Electrical Supply Company** name, to take over and operate that branch of the company's business. **Richard H. Brown** is president. Among the various branches of these companies are tool, cutting, stamping, soldering, brazing and polishing **departments.**

Review of the Wrought Metal Business

By J. J. WHITEHEAD
President of the Whitehead Metal Products Co. of New York, Inc.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

May 1, 1930.

As far as business in copper and brass products is concerned, the drastic cut of four cents a pound in the price of copper completely upset everyone. Naturally, after such a cut it is only reasonable to anticipate a period of inactivity until everyone becomes accustomed to the new prices. Previous to the cut, purchases were on a hand to mouth basis.

Users of metal are now wondering if a domestic price of 14c for copper and 14.30c c. i. f., is the bottom, or whether a further cut may be expected. Certain it is that there are approximately 250,000 tons of refined metal in stock and literally overhanging the market, so that for the time being it would seem that there will be plenty of metal available. However, domestic users of metal have not come into the market for their requirements. The public utilities, which have been withholding purchases because they claimed the price of copper was too high, should not now hesitate to purchase, for everyone will admit that 14 cents is a fair price for copper. The producers have shouldered a burden that will take them quite a while to get rid of and it would seem now that the consumers should do their part and start the ball a rolling by starting to buy their requirements.

Europe evidently thinks well of the 14 cent price because as soon as the price was cut 15,000 tons of copper was sold in two days, which is more copper than had been sold for export in a long while.

The revision of copper product prices has just been completed and the new prices are now before the trade. Undoubtedly the next few days will show whether or not the buying of copper and copper products was actually held up because users thought the price too high, or whether buying lagged because there was no demand for the metal and that the price had very little to do with it. Probably curtailment of business activity in all lines had quite a bearing, and the influence of the high price caused users to withhold purchases as long as possible, or until they actually had to have the metal to keep their plants going.

The demand for Monel metal is holding up in a remarkable manner, and it is advisable to keep requirements well covered.

More nickel is being used than ever before and in the event of any great upturn in business activity, nickel requirements should be anticipated in order that prompt deliveries may be obtained.

The demand for aluminum products which had fallen off is now again on the mend, but of course the demand is not nearly what it was last year.

Another drawback has been the uncertainty regarding the tariff.

While no great revival of business activity has been noted, everyone seems to be agreed that the worst is over and that from now on gradual improvement will be noted. Revival of building activity would help a great deal to straighten out the situation. Cheap money is helping to bring this about. Cheap money is also tending to reverse the trend of commodity prices and it will be noted that they are dragging along rather than sliding off appreciably. There is a minimum of fabricated products in stock but plenty of raw material.

Metal Market Review

By R. J. HOUSTON
D. Houston and Company, Metal Brokers, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

COPPER

May 1, 1930.

The drastic cut of four cents a pound in the price of copper was the outstanding development in April. A setback of this nature was a most significant change in trade policy. The violent downward revision in market values from 18 to 14 cents was accomplished at one swoop after the 18 cent basis had been maintained for a whole year, lacking one day. This radical change means a tremendous shrinkage in values and the probable loss of tens of millions of dollars on surplus stocks and new production.

A condition of subnormal business existed both here and abroad for many months. It was, therefore, only a question of time when the inevitable task of market readjustment would have to take place. The suddenness and severity of the action carries a story of its own. It reverberated round the world removing much of the uncertainty which hung over the situation, and has prepared the way for greater activity.

The slash in price resulted in an instantaneous and sharp rise in sales of copper for export at 14.30c c. i. f. European ports. Total volume of sales in the export division of the market during last month were on an enormous scale. Some of the foreign buying was for May and June shipment. Transactions for domestic account, however, were disappointingly limited.

Mine production and refinery output has undergone substantial curtailment. Despite that fact, however, surplus stocks have reached huge proportions. They have been rapidly increasing lately notwithstanding the pronounced attempt to cut down output. This is the feature that dominates the situation and causes universal attention.

ZINC

There are no visible signs of any vigorous movement in zinc that would broaden market activity and lift prices. Prime Western slab zinc is quoting 4.75c East St. Louis, a new low price for several years. Some business was reported at this level, but the market at this writing is still a dull affair and without any improvement in its technical position. Smelters' stocks on April 1 were 94,033 tons, an increase of 3,330 tons during March. They compare with 37,962 tons a year ago. The accumulated surplus has been growing larger each month for the past ten months. There was some substantial buying in April, but trading activity is not urgent enough to give the market a forward movement. Prices are nearly two cents a pound below what they were a year ago. Zinc, like other non-ferrous metals, is being overproduced.

TIN

Irregular and reactionary tendencies in the market for tin were well defined features lately. During the first half of April prompt Straits tin was quoted at 37c, but subsequently the market turned weak and on April 23 the price broke through to 35⅝c which established a new low level since 1922. The decline gave some encouragement to consuming demand and a fair amount of business resulted.

Recent buying was mostly for early shipment, but there was also a moderate tonnage taken for future delivery. The major reasons for the weakness in tin are the large visible supplies and the heavy output. Curtailment plans have been reported, but to whatever extent they are operative the supporting effect to market tendencies thus far has been nil. The canning and automobile industries are the greatest consumers of tin and its alloys, and over 40 per cent of the world's virgin tin production is consumed in this country. Over 99 per cent of the virgin tin required for domestic purposes is imported from foreign sources, according to the United States Bureau of Mines.

LEAD

There were market losses and two price reductions during the first half of the past month, the total revision bringing the price down to 5.50c New York basis. Heavy foreign supplies and an unsatisfactory European situation apparently had considerable to do with the downward tendency here. Recent demand was on a limited scale, but the large business transacted in March placed both sellers and buyers in a rather comfortable position as regards nearby supplies. Consumption is keeping up to an excellent level, and there is every reason to expect a heavy outlet for production here. The foreign position of the article is more or less uncertain owing to large stocks and lack of agreement respecting curtailment of output. Lead production in the United States and Mexico during March amounted to 83,241 tons of refined, against 72,774 tons in February. Stocks of refined, including antimonial, on April 1 were 53,615 tons, compared with 49,904 tons on March 1, an increase of 3,711 tons.

ALUMINUM

Though demand is not up to the 1929 scale, shipments and consumption recently showed increased volume. Requirements for the building industry and naval purposes have expanded somewhat lately. There is no special improvement in demand from the automotive industry, but a gradual expansion from this quarter is expected later in the year. Prices remain unchanged at 24.30c for 99% plus virgin ingot. There is a growing demand for aluminum in Russia. Large deposits of bauxite have been discovered in that country carrying a high percentage of aluminum. Smelting facilities are to be constructed for producing the metal on an important scale.

ANTIMONY

Easier market conditions developed for antimony and buying interest was notably quiet lately. Chinese regulus quotes 7.50c to 7.60c duty paid for prompt and nearby delivery. Chinese production is reported at 1,200 to 1,300 tons per month, with comparatively small shipments leaving that country. Stocks at Far East sources are understood to be in good volume. Shipments of regulus from China during the first quarter of this year were 2,146 tons, against 2,095 tons for the first quarter of 1929.

QUICKSILVER

Conditions in quicksilver have been rather unsettled lately and market has declined to $113 to $115 per flask of 76 pounds. There have been reports of European curtailment of output, but buying has not been stimulated to any important extent.

PLATINUM

The trend of this market has been downward, with refined platinum quoted a $43 per ounce. Weakness is said to be due to accumulated supplies and light demand.

SILVER

During the last two months silver has displayed a fair degree of stability. The all-time low of 39⅝c in this market and 15⅝d in London emphasized the extreme depression which has prevailed for the white metal the world over. There has been an absence of spectacular movements since and a recovery of 42⅝c. Fluctuations have been within narrow limits for several weeks, but the attempt at further depression is too risky in the present sensitive condition of the market. India bought moderately and China also operated on the buying side. Production of silver in United States in March was 5,225,000 ounces, against 5,161,000 ounces in February and 5,223,000 in March, 1929. Production of silver in Mexico in January, the latest month for which figures are available was 5,877,000 ounces, against 11,122,000 in December and 9,241,000 in January, 1929.

OLD METALS

Conditions in the scrap market have been unsettled and uncertain owing to the sudden break in the price of new copper. Domestic consumers and exporters are cautious in placing orders, but there has been a good movement in heavy brass for export shipment. There is a heavy latent demand awaiting more settled outlook. Prices are now on an attractive basis if the danger of further recessions is past, and a revival of strong buying is expected when the position of the market appears to warrant it. Dealers quote prices at 10¼c to 10¾c for heavy copper, 9¾c to 10c for light copper, 8¾c to 9c for new brass clippings, 4c for heavy lead, 2c to 2¼c for old zinc, and 14¼c to 14½c for aluminum clippings.

Daily Metal Prices for the Month of April, 1930

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4	7	8	9	10	11	14	15	16	17
Copper c/lb. Duty Free													
Lake (Del.)	17.875	17.875	17.875	17.875	18.00	18.00	18.00	18.00	18.00	18.00	14.00	14.00	14.00
Electrolytic (f. a. s. N. Y.)	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	14.00	14.00	14.00
Casting (f. o. b. refinery)	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.125	13.75	13.75	13.625
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb.													
Prime Western	4.85	4.90	4.90	5.00	5.00	4.95	4.95	4.925	4.925	4.925	4.875	4.825	4.80
Brass Special	4.95	5.00	5.00	5.05	5.05	5.00	5.00	4.975	4.975	4.975	4.925	4.875	4.85
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	36.875	36.875	36.60	36.35	36.10	36.40	36.90	37.00	37.20	36.625	36.35	36.375	36.50
Pig 99%	35.873	35.875	35.625	35.375	35.10	35.50	36.00	36.00	36.20	35.625	35.40	35.375	35.50
Lead (f. o. b. St. L.) c/lb. Duty 2⅛c/lb.	5.60	5.60	5.60	5.50	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	8.00	8.00	8.00	8.00	8.00	8.00	7.90	7.80	7.75	7.75	7.75	7.75	7.625
Silver c/oz. Troy Duty Free	42.125	41.875	41.625	42.125	42.125	42.25	42.50	42.875	42.375	42.625	42.375	42.625	42.625
Platinum $/oz. Troy Duty Free	44.00	44.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00

	18*	21	22	23	24	25	28	29	30	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Del.)	.....	14.00	14.00	14.00	*14.00	14.00	14.00	14.00	14.00	18.00	14.00	15.881
Electrolytic (f. a. s. N. Y.)	.....	14.00	14.00	14.00	14.00	13.75	13.50	14.00	13.50	18.00	13.50	15.845
Casting (f. o. b. refinery)	.....	13.50	13.50	13.50	13.50	13.25	13.25	13.25	13.00	17.25	13.00	15.25
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb.												
Prime Western	.....	4.80	4.80	4.75	4.75	4.75	4.75	4.75	4.75	5.00	4.75	4.854
Brass Special	.....	4.85	4.85	4.80	4.80	4.80	4.80	4.80	4.80	5.05	4.80	4.911
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	.....	36.375	35.875	35.625	35.50	35.00	34.70	34.25	34.00	37.20	34.00	36.070
Pig 99%	.....	35.375	34.875	34.75	34.625	34.125	33.75	33.375	33.125	36.20	33.125	35.117
Lead (f. o. b. St. L.) c/lb. Duty 2⅛c/lb.	.....	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.60	5.40	5.433
Aluminum c/lb. Duty 5c/lb.	.....	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.												
Ingot	.....	35	35	35	35	35	35	35	35	35	35	35
Shot	.....	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	.....	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	.....	7.60	7.60	7.60	7.60	7.60	7.60	7.60	7.60	8.00	7.60	7.768
Silver c/oz. Troy Duty Free	.....	42.50	42.50	42.875	42.50	42.625	42.50	42.50	42.375	42.875	41.625	42.405
Platinum $/oz. Troy Duty Free	.....	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	44.00	43.00	43.095

*Holiday

Metal Prices, May 1, 1930

NEW METALS

Copper: Lake, 14.00. Electrolytic, 13.50. Casting, 13.00.
Zinc: Prime Western, 4.70. Brass Special, 4.80.
Tin: Straits, 33.25. Pig, 99%, 32.50.
Lead: 5.40. **Aluminum,** 24.30. **Antimony,** 7.60.

Nickel: Ingot, 35. Shot, 36. Elec., 35. **Pellets,** 40.
Quicksilver: flask, 75 lbs., $116.00. **Bismuth,** $1.20.
Cadmium, 70. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 42.25.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $43.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	10½to10¾
Brass Ingots, Red	12¾to14
Bronze Ingots	14¾to17¾
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	25 to37
Manganese Bronze Ingots	13 to17
Manganese Bronze Forging	35 to43
Manganese Copper, 30%	25 to35
Monel Metal Shot	28 to35
Monel Metal Blocks	28 to35
Parsons Manganese Bronze Ingots	16½to19¾
Phosphor Bronze	14 to16
Phosphor Copper, guaranteed 15%	18 to20
Phosphor Copper, guaranteed 10%	17 to19
Phosphor Tin, no guarantee	42 to50
Silicon Copper, 10%, according to quantity	25 to35

OLD METALS

Buying Prices		Selling Prices
11.00to11.25	Strictly Crucible Copper	12.00to12.25
10.25to10.75	Heavy Copper and Wire	11.25to11.75
9.75to10.00	Light Copper	10.75to11.00
6.50to 6.75	Heavy Brass	7.50to 7.75
5.50to 5.75	Light Brass	6.50to 6.75
8.75to 9.00	No. 1 Composition	9.75to10.00
8.00to 8.25	New Composition Turnings	9.00to 9.25
4.00	Heavy Lead	5.00
2.00to 2.25	Old Zinc	3.00to 3.25
3.00to 3.25	New Zinc Clips	4.00to 4.25
14.25to14.50	Aluminum Clips (new)	18.00to19.00
8.75to 9.25	Scrap Aluminum, cast alloyed	12.00to14.00
10.25to10.50	Scrap Aluminum sheet (old)	12.00to13.00
24to26	No. 1 Pewter	20to30
20to21	Old Nickel Anodes	22to23
15to23	Old Nickel	17to25

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled)	23¾c. to 24¾c. net base
Front Stock	24¾c. to 25¾c. net base

BARE COPPER WIRE

15½c. to 15¾c. net base, in carload lots.

COPPER SEAMLESS TUBING

26c. to 27c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	22¼c. net base
100 lbs. to 300 lbs. in one order	22¾c. net base

ZINC SHEET

	Cents per lb.
Duty on sheet, 2c. per lb.	
Carload lots, standard sizes and gauges, at mill, less 7 per cent discount	Net Base 10.00
Casks, jobbers' price	10.50
Open casks, jobbers' price	11.00 to 11.25

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base, ton lots, per lb.	33.30
Aluminum coils, 24 ga., base price	31.00

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over N. Y. Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 44.50c. per ounce, Troy upward, according to quantity.

BRASS MATERIAL—MILL SHIPMENTS

In effect April 15, 1930
To customers who buy 5,000 lbs. or more in one order

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.20½	$0.22	$0.23
Wire	.21	.22½	.23½
Rod	.18¾	.22½	.23½
Brazed tubing	.28	....	.32½
Open seam tubing	.28½	....	.30¾
Angles and channels	.28½	....	.30¾

BRASS SEAMLESS TUBING

25½c. to 26½c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	23c. net base
Muntz or Yellow Metal Sheathing (14"x48")	21½c. net base
Muntz or Yellow Rectangular sheet other sheathing	22½c. net base
Muntz or Yellow Metal Rod	19¾c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	28½c.	10% Quality	31¼c.
15% Quality	30¼c.	15% Quality	35¼c.
18% Quality	31½c.	18% Quality	38½c.

MONEL METAL, SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs. 25c. over. Prices f. o. b. mill.

Supply Prices, May 1, 1930

ANODES

Copper:	Cast	25⅜c. per lb.
	Rolled, oval	23c. per lb.
	Rolled, sheets, trimmed	21¼c. per lb.
Brass:	Cast	24⅜c. per lb.
Zinc:	Cast	11¾c. per lb.
Nickel:	90-92%	45c. per lb.
	95-97%	47c. per lb.
	99%	49c. per lb.

Silver: Rolled silver anodes .999 fine are quoted from 45¼c., Troy ounce, upward, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & Over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Opens buffs, per 100 sections.

11" 20 ply 64/68 Unbleached	$20.85 to 26.93
14" 20 ply 64/68 Unbleached	30.93 to 36.74
11" 20 ply 80/92 Unbleached	24.14 to 28.22
14" 20 ply 80/92 Unbleached	35.57 to 42.64
11" 20 ply 84/92 Unbleached	34.84 to 40.43
14" 20 ply 84/92 Unbleached	51.67 to 60.35
11" 20 ply 80/84 Unbleached	31.07 to 35.60
14" 20 ply 80/84 Unbleached	46.05 to 53.60

Sewed Pieced Buffs, per lb., bleached .45c to 84c

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.11-.18
Acid—Boric (Boracic) Crystals	lb.	.08½
Chromic, 75 to 400 lb. drums	lb.	.18-.21
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.16¼-.21¼
Denatured, drums	gal.	.40-60
Alum—Lump, barrels	lb.	.0325
Powdered, barrels	lb.	.039
Ammonium chloride, solution in carboys	lb.	.06½
Ammonium—sulphate, tech., bbls	lb.	3.3
Sulphocyanide	lb.	.65
Arsenic, white, kegs	lb	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.25
Chromic Sulphate	lb.	.30-.40
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.20½
Cyanide (100 lb. kgs)	lb.	.45
Sulphate, bbls.	lb.	5.7
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$70.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lacquer Solvents	gal.	.85
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry bbls.	lb.	.35
Chloride, bbls.	lb.	.20
Salts, single, 300 lb. bbls.	lb.	.12½-.13
Salts, double, 425 lb. bbls.	lb.	.12½-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.093
Potassium Bichromate, casks (crystals)	lb.	.09¼
Carbonate, 96-98%	lb.	.06¼-.07
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.05½
Silver Chloride, dry, 100 oz. lots	oz.	.35¾-.37½
Cyanide (fluctuating)	oz.	.44-.47
Nitrate, 100 ounce lots	oz.	.30¾-.32¼
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.17
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¾
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.02
Sulpho Cyanide	lb.	.32½-.42½
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.32
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, casks	lb.	.06[illegible]
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03½